D.S.E. Physics

Mock Examination 2024

S.6 PHYSICS

C.W.Sham

& His Team

College BEACON 澄理學校

Diploma of Secondary Education

D.S.E. Physics

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注意事項

1. 同學們可把本書撕開，分成試卷各部份，作答和對答案時更方便。

2. 答卷時要特別留意單位(unit)，除了一些可以兩邊約的公式，其餘公式代入數字時必須要全部轉為 **SI unit**。

3. 有效數字(significant figures)的表達，計算過程可取4至5個，到了最後答案，便應該寫成3個有效數字。

4. 這份卷的題目，全部是我份筆記中的內容，如果成績不理想，便是對課程內容不熟習，補救方法是儘量溫筆記，不要亂做其他練習。如果本試卷成績理想，能夠達到八成或以上，摘星一定沒有困難。

5. 考試前幾日，儘量溫 Notes，記熟公式，Past paper 和 Exercise 做不完不要緊，最重要是 Notes 溫得熟。

6. 考試前的一晚，溫習不要超過晚上九時，好讓腦部有充分休息，也不要聽歌，否則明天考試時旋律會在腦部縈繞。細心執拾文具，不要遲過十一時睡覺。物理科是需要動腦筋的科目，必須要有充足的睡眠時間。

7. 考試當天不要帶書或筆記，儘量以輕鬆的心情去應考。

8. 要帶備的文具：原子筆、鉛筆、鉛筆刨、擦膠、間尺、計算機、水、濕紙巾。

9. 入試場前，最好洗一個冷水臉，可以振作精神。

10. 入到試場坐好後，可把手錶放於檯面，提醒自己控制時間。

11. 答卷時，可順著次序做，或先做容易些的題目以加強信心，當遇到艱深的問題時，假如一時不能破解，最好先行略過，好處是：

    ※ 不會浪費大量時間。

    ※ 不會引致面紅耳熱，腦筋失靈。

12. 考試期間，如果太緊張，可用濕紙巾擦臉，舉手要求飲水，使自己鬆弛下來。

13. 答卷一時，應用大約五十分鐘完成 Section A 的多項選擇題，餘下一百分鐘做 Section B，其中六十分鐘做短題目，四十分鐘做四條長題目。

14. 卷一內有些題目打上星(*)，是屬實以前AL的題材，並不代表較艱深。最簡單的做法是完全忽略那粒星。

15. 考完卷一解散後，千萬不要對卷或討論，應洗一個冷水臉，讓腦部鬆弛及休息。

16. 答卷二時，可任選任何兩個 Elective 作答。如果答多過兩個 Elective，考試局將會計算最高分那兩個。每一個 Elective 應在三十分鐘內完成，可用十五分鐘完成 M.C.，十五分鐘完成 Question。

17. 注意入到試場要保持最佳狀態，才能答題流暢。

18. 祝各位同學考試順利，獲得滿意的成績。

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

Mock Examination

PHYSICS PAPER 1A

	A	B	C	D
1.	☐	☐	☐	☐
2.	☐	☐	☐	☐
3.	☐	☐	☐	☐
4.	☐	☐	☐	☐
5.	☐	☐	☐	☐

	A	B	C	D
6.	☐	☐	☐	☐
7.	☐	☐	☐	☐
8.	☐	☐	☐	☐
9.	☐	☐	☐	☐
10.	☐	☐	☐	☐

	A	B	C	D
11.	☐	☐	☐	☐
12.	☐	☐	☐	☐
13.	☐	☐	☐	☐
14.	☐	☐	☐	☐
15.	☐	☐	☐	☐

	A	B	C	D
16.	☐	☐	☐	☐
17.	☐	☐	☐	☐
18.	☐	☐	☐	☐
19.	☐	☐	☐	☐
20.	☐	☐	☐	☐

	A	B	C	D
21.	☐	☐	☐	☐
22.	☐	☐	☐	☐
23.	☐	☐	☐	☐
24.	☐	☐	☐	☐
25.	☐	☐	☐	☐

	A	B	C	D
26.	☐	☐	☐	☐
27.	☐	☐	☐	☐
28.	☐	☐	☐	☐
29.	☐	☐	☐	☐
30.	☐	☐	☐	☐

	A	B	C	D
31.	☐	☐	☐	☐
32.	☐	☐	☐	☐
33.	☐	☐	☐	☐
34.	☐	☐	☐	☐
35.	☐	☐	☐	☐

	A	B	C	D
36.	☐	☐	☐	☐
37.	☐	☐	☐	☐
38.	☐	☐	☐	☐
39.	☐	☐	☐	☐
40.	☐	☐	☐	☐

	A	B	C	D
41.	☐	☐	☐	☐
42.	☐	☐	☐	☐
43.	☐	☐	☐	☐
44.	☐	☐	☐	☐
45.	☐	☐	☐	☐

2024 MOCK EXAMINATION

PHYSICS PAPER 1

8.30 am – 11.00 am (2 hours 30 minutes)

This paper must be answered in English

GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 50 minutes.

2. Section A consists of multiple-choice questions in this question paper, while Section B contains conventional questions printed separately in Question-Answer Book **B**.

3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book for Section B will be collected separately at the end of the examination.**

4. The diagrams in this paper are **NOT** necessarily drawn to scale.

5. The last pages of this question paper contain a list of data, formulae and relationships which you may find useful.

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF SECTION A'** after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on Answer Sheet, so that wrong marks can be completely erased with a certain rubber. You must mark the answers clearly, otherwise you will lose marks if the answers cannot be captured.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

Section A

There are 33 questions.

1. Inside a copper container, 0.95 kg of water initially at 25 °C is heated by a heater of power 1200 W for 15 minutes. Assume that the copper container has the same temperature of the water and neglect heat lost to the surrounding air, how much water remains inside the container after the heating process ?

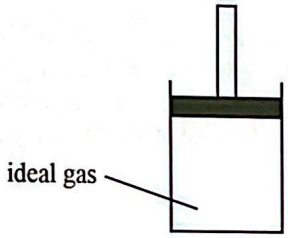
Given : specific heat capacity of water = 4200 J kg^{-1} $°C^{-1}$
specific latent heat of vaporization = 2.26×10^6 J kg^{-1}
heat capacity of the copper container = 400 J $°C^{-1}$

A. 0.41 kg
B. 0.62 kg
C. 0.85 kg
D. 0.79 kg

*2. A balloon filled with 0.25 g of helium gas has a volume of 800 cm^3. If the root-mean-square speed of the helium gas inside the balloon is 1250 m s^{-1}, what is the gas pressure in the balloon ?

A. 163 kPa
B. 194 kPa
C. 208 kPa
D. 275 kPa

*3. A fixed mass of an ideal gas is contained in a cylinder fitted with a smooth piston as shown.



The gas is then cooled under constant pressure. Which of the following statements is/are correct ?

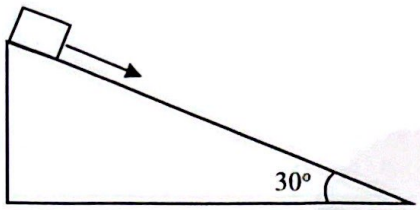
(1) The frequency of collisions of the gas molecules on the walls of the container would decrease.
(2) The average force acting on the wall of the piston by the gas molecules would decrease.
(3) The average separation of the gas molecules would decrease.

A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

4. A lorry is travelling at a uniform speed of 18 m s^{-1} along a straight road. At time t = 0 s, the driver of the lorry notices that a traffic light at a distance of 36 m from the lorry is turning red. After a reaction time of 0.25 s, the driver applies the brake. The lorry then decelerates uniformly and comes to rest at t = 2.75 s. Find the deceleration of the lorry during the braking period.

A. 3.6 m s^{-2}
B. 4.1 m s^{-2}
C. 6.5 m s^{-2}
D. 7.2 m s^{-2}

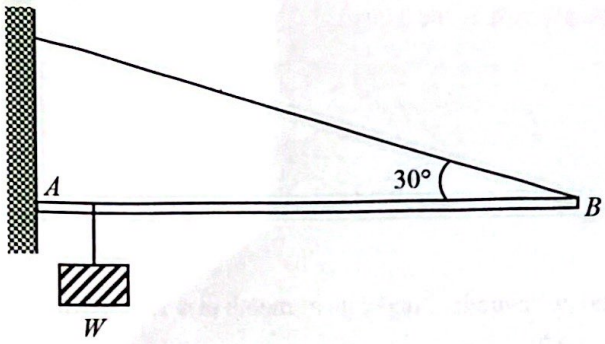
5.



A block of mass 0.2 kg is resting on an inclined plane with inclination angle of 30° with the horizontal. When the block is given a sharp push, it moves down with an initial speed of 2.5 m s^{-1}. After moving for 0.8 m along the inclined plane, the block comes to rest. Calculate the work done against friction during this process. Neglect air resistance.

A. 1.41 J
B. 2.38 J
C. 3.68 J
D. 4.45 J

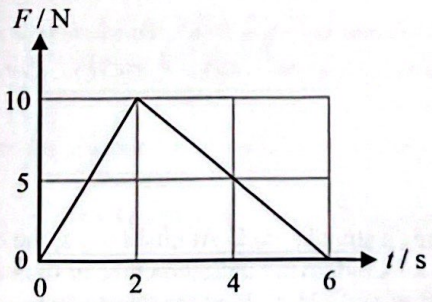
6.



A uniform metre rule AB is hinged to the wall at the end A and the other end B is connected by an inextensible string to a point directly above A so that the metre rule is horizontal. The string is inclined at an angle of 30° with the metre rule. When a weight W of 3 N is hanged at a distance of 20 cm from point A on the metre rule, the tension of the string is 1.8 N. What would be the tension of the string if the weight W is shifted to a distance of 40 cm from point A ?
Take g to be 10 m s^{-2}.

A. 2.5 N
B. 3.0 N
C. 3.5 N
D. 4.0 N

7.



An object of mass 7.5 kg is initially at rest on a smooth horizontal ground. A force F is applied horizontally to the object. The magnitude of the applied force F varies with the time t as shown in the above figure. What is the kinetic energy of the object at the time instant of 6 s ?

A. 15 J
B. 30 J
C. 60 J
D. 120 J

8. Peter of mass 60 kg is standing on a balance inside a lift. In a certain situation, Peter found that the balance registers a reading of 630 N. Which of the following statements is/are correct ?

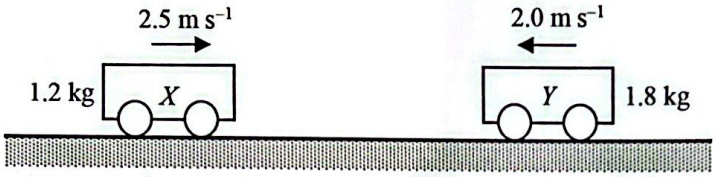
(1) The lift must be moving upwards with acceleration.
(2) The force acting on the balance by Peter is the weight of Peter.
(3) The force acting on Peter by the balance and the force acting on the balance by Peter form an action-reaction pair.

A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

9. A ball of mass 0.4 kg is released from rest at a vertical height of 5 m above the ground. After impact with the ground, the rebound speed of the ball is reduced by 25%. The duration time of impact of the ball with the ground is 0.2 s. Assume air resistance is negligible and take the acceleration due to gravity to be 10 m s^{-2}, find the average force acting on the ball by the ground during the impact.

A. 15 N
B. 25 N
C. 35 N
D. 39 N

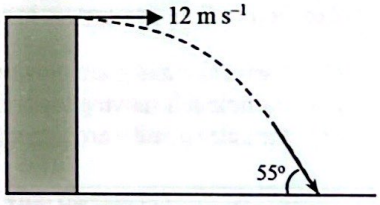
10.



Two trolleys *X* and *Y* are moving towards each other along a smooth horizontal runway as shown in the above figure. After the collision, trolley *Y* moves with a velocity of 0.8 m s^{-1} towards the right. What is the amount of kinetic energy that is converted into internal energy during the collision ?

A. 1.22 J
B. 1.35 J
C. 4.41 J
D. 5.04 J

*11. A ball is projected horizontally from the top of a building with an initial velocity of 12 m s^{-1}. It hits the ground making an angle of 55° with the horizontal as shown in the figure. What is the height of the building ? Take the acceleration due to gravity *g* to be 10 m s^{-2}.



A. 12.5 m
B. 13.2 m
C. 14.7 m
D. 16.5 m

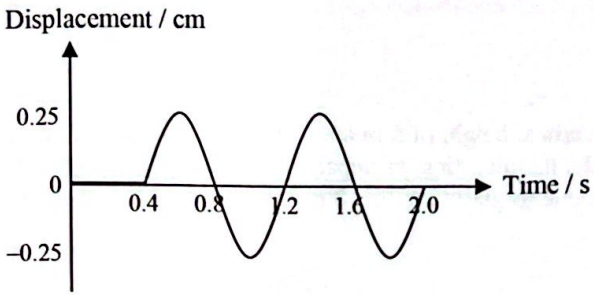
*12. An aircraft is moving in a horizontal plane at a constant speed of 250 m s^{-1}. If it turns round along a circular path with radius of 45 km, what is the ratio of the centripetal force to the weight of the aircraft ?

A. 0.14
B. 0.19
C. 0.35
D. 0.54

*13. A satellite orbits the Earth in a circular path with a speed of 4800 m s^{-1}. Given that the mass of the Earth is 6.0×10^{24} kg, what is the radius of the orbit of the satellite ?

A. 1.25×10^7 m
B. 1.48×10^7 m
C. 1.74×10^7 m
D. 2.54×10^7 m

14.



A series of plane water waves are generated by a plane vibrator in a ripple tank, starting at time $t = 0$. A cork is placed on the water surface at a distance of 1.8 cm from the vibrator. The graph above shows the variation of the displacement of the cork with time. Find the wavelength of the water waves in the ripple tank.

A. 1.2 cm
B. 1.8 cm
C. 2.4 cm
D. 3.6 cm

15.

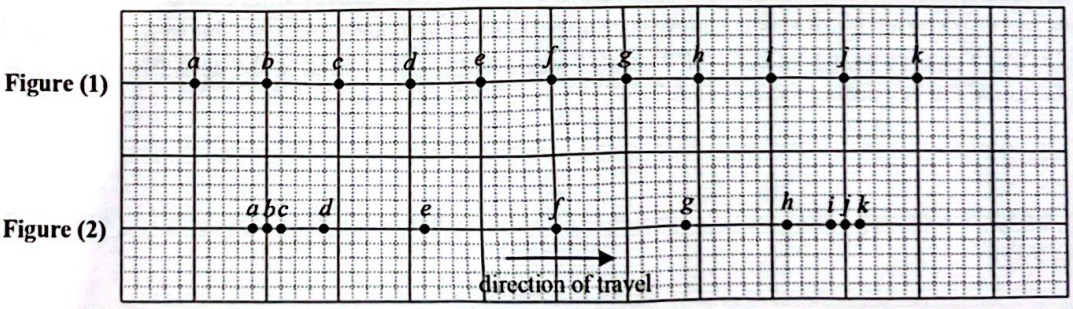


Figure (1) shows the equilibrium positions of particles a to k in a medium. Figure (2) shows a longitudinal wave travelling from left to right at a certain instant t_o. Which of the following statements concerning the particles in Figure (2) are correct ?

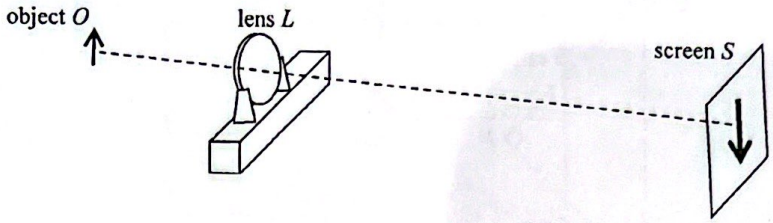
(1) Particles e and g are moving in the same direction towards the left at the instant t_o.
(2) Particle h is moving towards the left at a quarter of period after t_o.
(3) Particles a and e are moving in opposite phase.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

16. The speed of light in a plastic is 1.6×10^8 m s^{-1}. What is the critical angle of light of this plastic ?

A. 30°
B. 32°
C. 34°
D. 36°

17.



An object O placed 15 cm in front of a convex lens L gives a sharp image with magnification of 4 on the screen S as shown. What should be the object distance so that a sharp image of the same size as the object can be formed on the screen placing at suitable position ?

A. 20 cm
B. 24 cm
C. 30 cm
D. 32 cm

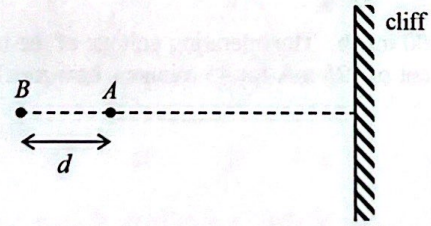
*18. A monochromatic yellow light of wavelength 580 nm is incident normally on a diffraction grating. The second order of diffracted maximum is observed at an angle of 45° from the central line. If another monochromatic blue light of wavelength 450 nm is used, that is the highest order of diffracted maximum that can be observed ?

A. 3
B. 4
C. 5
D. 6

*19. In a Young's double-slit experiment, a monochromatic light is used. The slit separation of the double slits is 0.25 mm. Alternate bright and dark fringes are formed on a screen placed at 1.5 m from the double slits. If the separation between the first and the tenth bright fringes is 35 mm, calculate the wavelength of the monochromatic light.

A. 448 nm
B. 525 nm
C. 583 nm
D. 648 nm

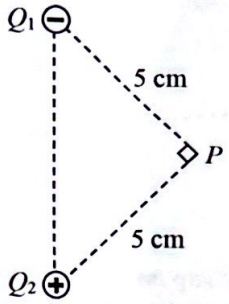
20.



Peter claps his hands in front of a cliff at the position A as shown in the figure. He hears the echo 0.75 s later. He then walks a distance d away from the cliff and claps again at the position B. This time he hears the echo 0.93 s later. Find d if the speed of sound in air is 340 m s^{-1}

A. 31 m
B. 46 m
C. 62 m
D. 93 m

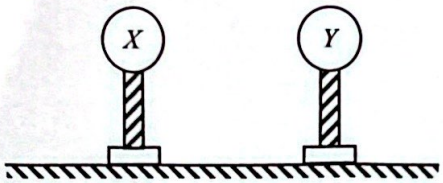
*21.



In the above figure, Q_1 and Q_2 are two point charges at the two vertices of a right-angled isosceles triangle. Q_1 is negative and Q_2 is positive. They carry the same magnitude of charge. The resultant electric field E due to the two point charges at the point P is 32000 N C^{-1}. Determine the direction of the resultant electric field E at P, and the magnitude of the point charge Q_1.

	direction of E	**magnitude of Q_1**
A.	upwards	6.3 nC
B.	upwards	8.9 nC
C.	downwards	6.3 nC
D.	downwards	8.9 nC

22.



X and Y are two small identical metal spheres carrying charges $+2Q$ and $-6Q$ respectively. When X and Y are separated by a distance d, the magnitude of the electrostatic force between them is F. The two spheres are then brought to touch each other and then separated at a distance of $2d$. The electrostatic force between them becomes

A. $\frac{1}{3}F$
B. $\frac{1}{4}F$
C. $\frac{1}{6}F$
D. $\frac{1}{12}F$

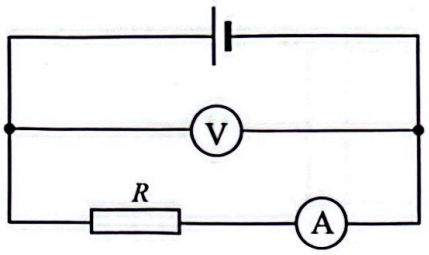
23. A mobile phone battery has a capacity of 4500 mA h. The operating voltage of the battery keeps at 3.7 V during discharge. After the battery operates normally at a current of 225 mA for 45 minutes, how much chemical energy is still left inside the battery ?

A. 16.0 W h
B. 15.6 W h
C. 15.2 W h
D. 14.8 W h

24. A heater is connected to a sinusoidal a.c. source with a supply peak voltage of 50 V. The peak current given out by the source is 640 mA. What is the average power dissipated by the heater ?

A. 8 W
B. 16 W
C. 23 W
D. 32 W

25.

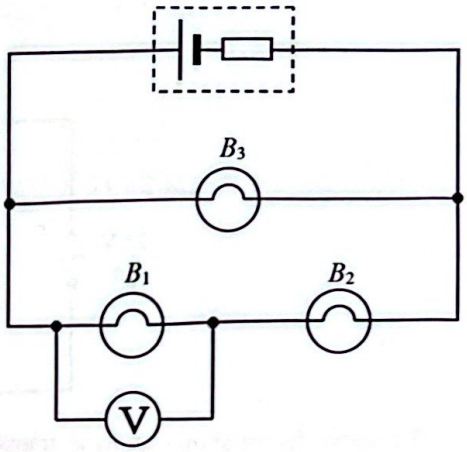


The above circuit can be used to find the resistance of the resistor R. The voltmeter and the ammeter are not ideal. Which of the following statements are correct ?

(1) The reading of the voltmeter is in fact larger than the actual voltage across R.
(2) The ratio of voltmeter reading to ammeter reading is in fact larger than the resistance of R.
(3) The circuit is suitable for measuring small resistance.

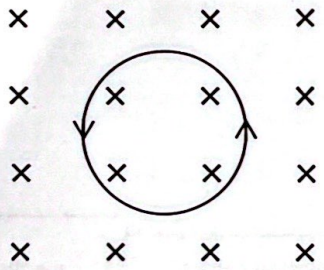
A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

26. In the circuit, the cell has an e.m.f. of 12 V and internal resistance of 10 Ω. Three identical light bulbs are connected as shown. The resistance of each light bulb is 30 Ω. The voltmeter connected across B_1 is ideal. Initially, all the three light bulbs give out light. After a while, bulb B_1 is burnt and becomes an open circuit. Find the reading of the voltmeter before and after B_1 is burnt.



	before B_1 burnt	after B_1 burnt
A.	4.0 V	4.5 V
B.	4.0 V	9.0 V
C.	8.0 V	4.5 V
D.	8.0 V	9.0 V

27.

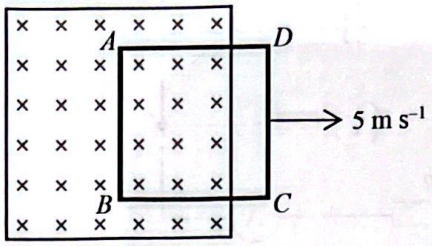


The above figure shows a charged particle moving in a circle of radius r with constant speed v on a plane perpendicular to a uniform magnetic field B directed into paper. Which of the following statements concerning the motion of the particle are correct ?

(1) The particle must carry positive charge.
(2) If the magnetic field B decreases, the radius of revolution of the particle would increase.
(3) If the magnetic field B decreases, the period of revolution of the particle would decrease.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

*28.

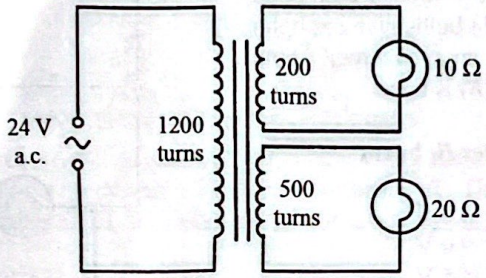


A square metal loop *ABCD* of side length 6 cm is placed partly inside a region of uniform magnetic field directed into paper. The resistance of each side of the loop is 0.2 Ω. The flux density of the magnetic field is 0.4 T. When the loop is moved towards the right with a velocity of 5 m s^{-1} as shown, which of the following statements are correct ?

(1) The induced current along the loop is in clockwise direction.
(2) The magnitude of the induced current in the loop is 0.15 A.
(3) The potential difference across the side *AB* is 0.12 V.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

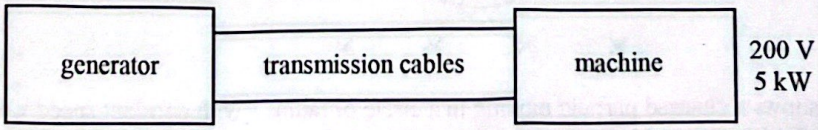
*29.



The above figure shows an ideal transformer with two secondary coils connected to two light bulbs. When a 24 V a.c. supply is connected to the primary coil, what is the current in the primary coil ?

A. 0.125 A
B. 0.175 A
C. 0.275 A
D. 0.325 A

*30.



An a.c. generator is supplying electrical power to operate a machine which has a rating of 5 kW at 200 V. The power is transmitted through transmission cables of total resistance 10 Ω. Before reaching the machine, an ideal step-down transformer (not shown in the figure) with turns ratio 5000 : 800 is used. If the machine works normally, what is the power loss in the transmission cables ?

A. 160 W
B. 320 W
C. 640 W
D. 6250 W

*31. A sample of radioactive source X undergoes alpha decay to become a stable nuclei Y. At a certain instant, X decays at a rate of 1500 disintegrations per second. The decay constant of the source X is 5×10^{-3} s^{-1}. What is the number of undecayed nuclei X left in the sample after 2 minutes ?

A. 1.2×10^5
B. 1.6×10^5
C. 2.2×10^5
D. 2.8×10^5

*32. X and Y are two different radioactive nuclides. The ratio of the mass of an atom of X to that of an atom of Y is 4 : 1. The ratio of half-lives of X to that of Y is 1 : 2. If two samples consisting of purely X and Y respectively have the same mass, find the ratio of the activity of X to that of Y.

A. 1 : 4
B. 1 : 2
C. 2 : 1
D. 4 : 1

*33. A radium-226 nucleus undergoes alpha decay into a radon nucleus.

Given : mass of a radium nucleus = 3.7543×10^{-25} kg
mass of a radon nucleus = 3.6877×10^{-25} kg
mass of an alpha particle = 6.6483×10^{-27} kg

Assume the energy possessed by the daughter nucleus is negligible, find the speed of the alpha particle emitted after decay.

A. 1.2×10^7 m s^{-1}
B. 1.5×10^7 m s^{-1}
C. 1.8×10^7 m s^{-1}
D. 2.1×10^7 m s^{-1}

End of Section A

List of data, formulae and relationships

Data

molar gas constant	$R = 8.31\ \text{J mol}^{-1}\ \text{K}^{-1}$
Avogadro constant	$N_A = 6.02 \times 10^{23}\ \text{mol}^{-1}$
acceleration due to gravity	$g = 9.81\ \text{m s}^{-2}$ (close to the Earth)
universal gravitational constant	$G = 6.67 \times 10^{-11}\ \text{N m}^2\ \text{kg}^{-2}$
speed of light in vacuum	$c = 3.00 \times 10^8\ \text{m s}^{-1}$
charge of electron	$e = 1.60 \times 10^{-19}\ \text{C}$
electron rest mass	$m_e = 9.11 \times 10^{-31}\ \text{kg}$
permittivity of free space	$\varepsilon_0 = 8.85 \times 10^{-12}\ \text{C}^2\ \text{N}^{-1}\ \text{m}^{-2}$
permeability of free space	$\mu_0 = 4\pi \times 10^{-7}\ \text{H m}^{-1}$
atomic mass unit	$u = 1.661 \times 10^{-27}\ \text{kg}$ (1 u is equivalent to 931 MeV)
astronomical unit	$\text{AU} = 1.50 \times 10^{11}\ \text{m}$
light year	$\text{ly} = 9.46 \times 10^{15}\ \text{m}$
parsec	$\text{pc} = 3.09 \times 10^{16}\ \text{m} = 3.26\ \text{ly} = 206265\ \text{AU}$
Stefan constant	$\sigma = 5.67 \times 10^{-8}\ \text{W m}^{-2}\ \text{K}^{-4}$
Planck constant	$h = 6.63 \times 10^{-34}\ \text{J s}$

Rectilinear motion

For uniformly accelerated motion :

$$v = u + at$$

$$s = ut + \tfrac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

Mathematics

Equation of a straight line	$y = mx + c$
Arc length	$= r\theta$
Surface area of cylinder	$= 2\pi rh + 2\pi r^2$
Volume of cylinder	$= \pi r^2 h$
Surface area of sphere	$= 4\pi r^2$
Volume of sphere	$= \frac{4}{3}\pi r^3$

For small angles, $\sin\theta \approx \tan\theta \approx \theta$ (in radian)

Astronomy and Space Science

$U = -\dfrac{GMm}{r}$	gravitational potential energy
$P = \sigma A T^4$	Stefan's law
$\left\|\dfrac{\Delta f}{f_0}\right\| \approx \dfrac{v}{c} \approx \left\|\dfrac{\Delta\lambda}{\lambda_0}\right\|$	Doppler effect

Energy and Use of Energy

$E = \dfrac{\Phi}{A}$	illuminance
$\dfrac{Q}{t} = k\dfrac{A(T_H - T_C)}{d}$	rate of energy transfer by conduction
$U = \dfrac{k}{d}$	thermal transmittance U-value
$P = \dfrac{1}{2}\rho A v^3$	maximum power by wind turbine

Atomic World

$\frac{1}{2}m_e v_{max}^2 = hf - \phi$	Einstein's photoelectric equation
$E_n = -\dfrac{13.6}{n^2}\text{eV}$	energy level equation for hydrogen atom
$\lambda = \dfrac{h}{p} = \dfrac{h}{mv}$	de Broglie formula
$\theta \approx \dfrac{1.22\lambda}{d}$	Rayleigh criterion (resolving power)

Medical Physics

$\theta \approx \dfrac{1.22\lambda}{d}$	Rayleigh criterion (resolving power)
$\text{power} = \dfrac{1}{f}$	power of a lens
$L = 10\log\dfrac{I}{I_0}$	intensity level (dB)
$Z = \rho c$	acoustic impedance
$\alpha = \dfrac{I_r}{I_0} = \dfrac{(Z_2 - Z_1)^2}{(Z_2 + Z_1)^2}$	intensity reflection coefficient
$I = I_0 e^{-\mu x}$	transmitted intensity through a medium

A1.	$E = mc\Delta T$	energy transfer during heating and cooling
A2.	$E = l\,\Delta m$	energy transfer during change of state
A3.	$pV = nRT$	equation of state for an ideal gas
A4.	$pV = \frac{1}{3}Nm\overline{c^2}$	kinetic theory equation
A5.	$E_k = \frac{3RT}{2N_A}$	molecular kinetic energy

B1.	$F = m\frac{\Delta v}{\Delta t} = \frac{\Delta p}{\Delta t}$	force
B2.	moment $= F \times d$	moment of a force
B3.	$E_p = m\,g\,h$	gravitational potential energy
B4.	$E_k = \frac{1}{2}mv^2$	kinetic energy
B5.	$P = Fv = \frac{W}{t}$	mechanical power
B6.	$a = \frac{v^2}{r} = \omega^2 r$	centripetal acceleration
B7.	$F = \frac{Gm_1m_2}{r^2}$	Newton's law of gravitation

C1.	$\Delta y = \frac{\lambda D}{a}$	fringe width in double-slit interference
C2.	$d \sin\theta = n\lambda$	diffraction grating equation
C3.	$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$	equation for a single lens

D1.	$F = \frac{Q_1Q_2}{4\pi\varepsilon_0 r^2}$	Coulomb's law
D2.	$E = \frac{Q}{4\pi\varepsilon_0 r^2}$	electric field strength due to a point charge
D3.	$E = \frac{V}{d}$	electric field between parallel plates (numerically)
D4.	$R = \frac{\rho l}{A}$	resistance and resistivity
D5.	$R = R_1 + R_2$	resistors in series
D6.	$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$	resistors in parallel
D7.	$P = IV = I^2R$	power in a circuit
D8.	$F = BQv\sin\theta$	force on a moving charge in a magnetic field
D9.	$F = BIl\sin\theta$	force on a current-carrying conductor in a magnetic field
D10.	$B = \frac{\mu_o I}{2\pi r}$	magnetic field due to a long straight wire
D11.	$B = \frac{\mu_o NI}{l}$	magnetic field inside a long solenoid
D12.	$\varepsilon = N\frac{\Delta\Phi}{\Delta t}$	induced e.m.f.
D13.	$\frac{V_s}{V_p} \approx \frac{N_s}{N_p}$	ratio of secondary voltage to primary voltage in a transformer

E1.	$N = N_0e^{-kt}$	law of radioactive decay
E2.	$t_{\frac{1}{2}} = \frac{\ln 2}{k}$	half-life and decay constant
E3.	$A = kN$	activity and the number of undecayed nuclei
E4.	$E = mc^2$	mass-energy relationship

Hong Kong Diploma of Secondary Education Examination

2024

Mock Examination

PHYSICS PAPER 1

SECTION B : Question-Answer Book B

This paper must be answered in English

Please stick the barcode label here.

Candidate Number

Short Questions Question No.	Marks
1	4
2	7
3	6
4	6
5	5
6	6
7	5
8	5
9	6
Long Questions Questions Question No.	**Marks**
10	9
11	8
12	8
13	9

INSTRUCTIONS FOR SECTION B

(1) After the announcement of the start of the examination, you should first write you Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided.

(2) Refer to the general instructions on the cover of the Question Paper for Section A.

(3) Answer **ALL** questions.

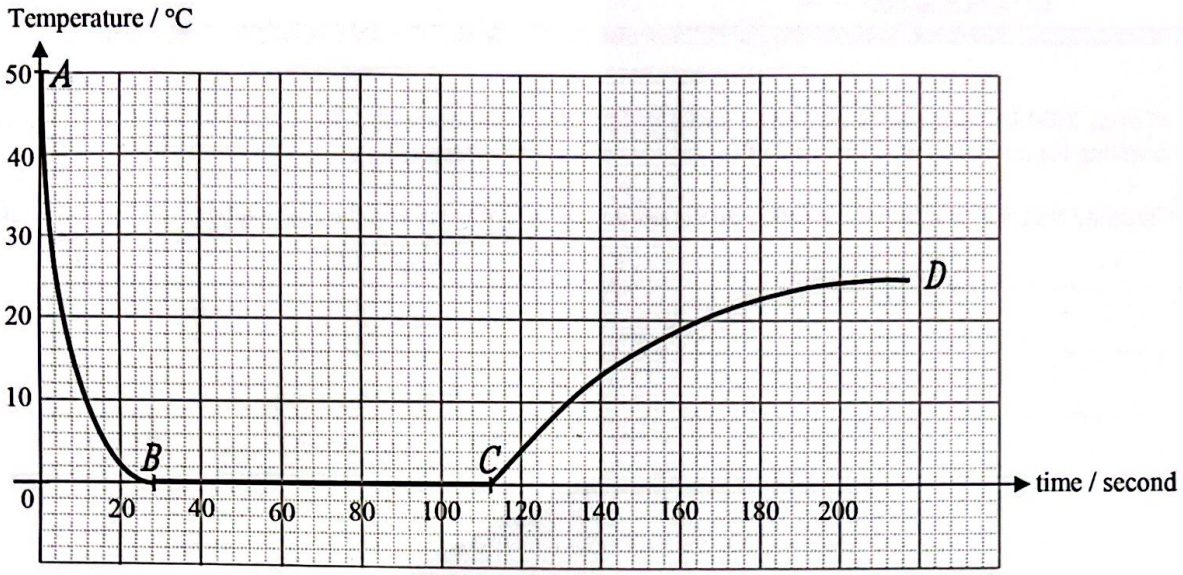
(4) Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.

(5) Graph paper and supplementary answer sheets will be provided on request. Write your candidate number, mark the questions box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this Question-Answer Book.

(6) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

Section B : Answer ALL questions. Write your answers in the spaces provided.

1.



A cup of negligible heat capacity contains 350 g of warm water at 50 °C. At time $t = 0$, some ice cubes of total mass 300 g at 0 °C are added into the cup. The temperature-time graph of the water in the cup is shown in the above Figure.

Given : specific heat capacity of water = 4 200 J kg^{-1} $°C^{-1}$
specific latent heat of fusion of ice = 334 000 J kg^{-1}

(a) At the instant *B*, the temperature of water is lowered to 0 °C. Calculate the total mass of water in the cup at this instant. Assume there is no heat exchange with the surroundings from *A* to *B*. (2 marks)

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(b) From *B* to *C*, the mixture of ice and water remains at 0 °C. Find the average rate of heat gained from the surrounding air in this time interval.

(2 marks)

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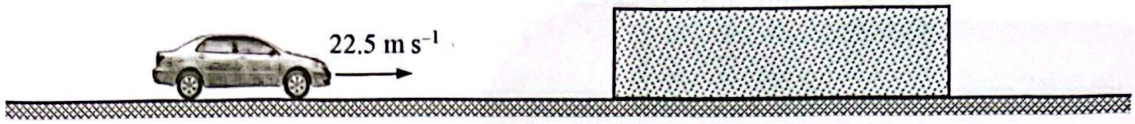


A car of mass 2400 kg travelling at a constant speed of 22.5 m s^{-1} collides with a large cushion box fixed on a road. After travelling for a distance of 7.5 m inside the box, the car comes to stop.

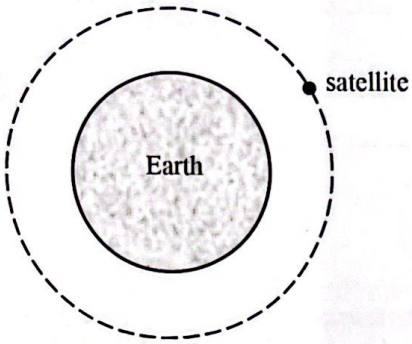
(a) Calculate the total retarding force acting on the car during the collision with the cushion box. (2 marks)

(b) During the collision, explain whether the total momentum of the car and the cushion box is conserved or not. (2 marks)

(c) During the collision, the driver of mass 60 kg is brought to stop within a time of 0.5 s. Calculate the average impact force acting on the driver during the collision. (2 marks)

(d) Explain why the front and rear parts of cars are designed to be collapsible. (1 mark)

*3. A satellite of mass 7500 kg orbits around the Earth in the orbit at a height of 4500 km above the surface of the Earth. Radius of the Earth is 6370 km.



(a) Find the acceleration of the satellite. (2 marks)

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(b) Calculate the speed of the satellite. (2 marks)

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(c) Calculate the number of cycles that the satellite revolve around the Earth in one day. (2 marks)

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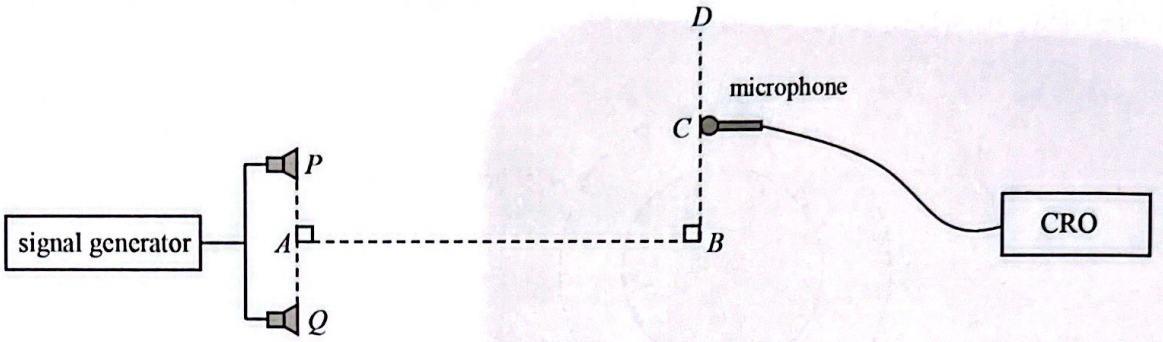
4.



Billy designs an experiment to demonstrate the interference of sound. He connects two identical loudspeakers P and Q to a signal generator, which frequency is adjusted to 550 Hz, so that they emit sound waves in phase. The two loudspeakers are placed with a separation of a. Speed of sound waves in air is 330 m s^{-1}.

(a) Billy then detects a maximum sound at the position B. When he moves the microphone from B towards D, he detects a minimum sound at the position C. Find the path difference at the position C. (2 marks)

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(b) As Billy continues to move the microphone towards D and beyond, he finds that he can never detect the first maximum. Suggest a possible reason behind. (2 marks)

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(c) State what happens at C if the following cases occurs separately :

(i) the frequency of the signal generator is doubled ; (1 mark)

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(ii) the two loudspeakers emit sound waves in opposite phase. (1 mark)

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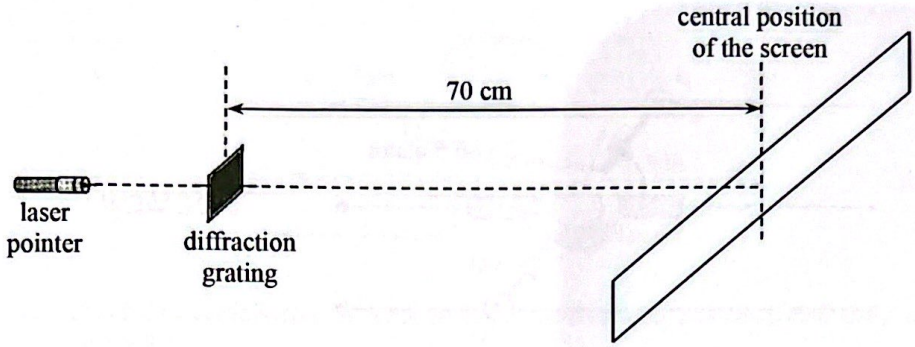
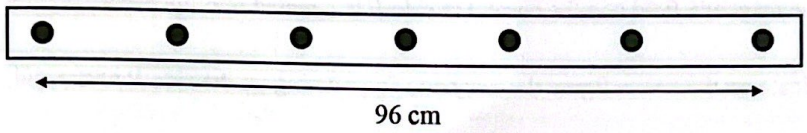
*5.



A laser beam emitting blue light of unknown wavelength λ is directed perpendicularly towards a diffraction grating as shown. The grating has 4000 lines per cm. A screen is placed at 70 cm from the grating. The bright spot formed on the screen is shown below :



(a) Find the grating spacing of the diffraction grating. (1 mark)

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(b) From the spot pattern formed on the screen, determine the wavelength λ of the blue light. (2 marks)

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(c) State the change of the separation between two adjacent spots projected on the screen for the following cases :

(i) another laser pointer emitting green light is used (1 mark)

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(ii) another diffraction grating with more lines per cm (1 mark)

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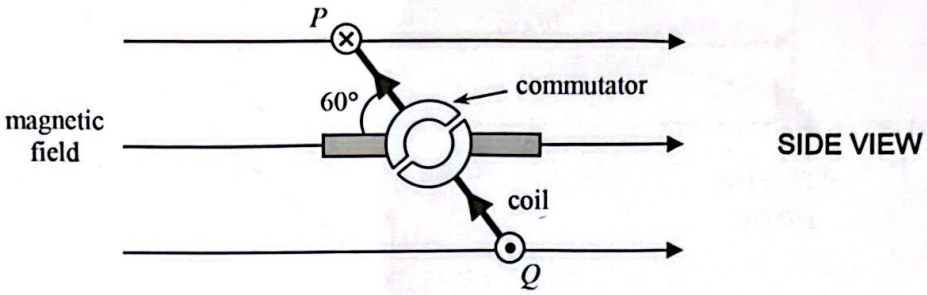
6.



The above figure shows the side view of part of a simplified d.c. motor. The coil *PQRS* (*RS* not shown in the figure) is a square loop of each side 5 cm and the coil has a total of 80 turns. It is inside a uniform magnetic field of 1.25 T directed towards the right. The current supplied to the motor from the battery is 2.5 A. At a certain instant, the coil makes an angle of 60° with the magnetic field and the current at side *P* is directed into the paper, as shown in the figure.

(a) By using an arrow, indicate on the above figure the magnetic force acting on the side *P* of the coil. (1 mark)

*(b) Calculate the magnetic force acting on the side *P* of the coil. (2 marks)

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(c) Find the moment of the magnetic forces acting on the coil about the axis of the rotating coil. State the direction of the moment. (2 marks)

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(d) State the function of the commutator in a d.c. motor. (1 mark)

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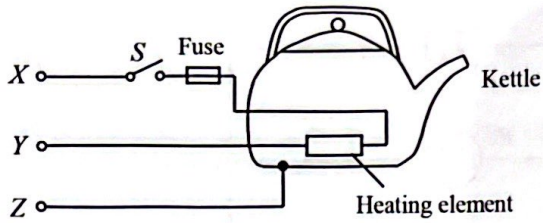
7.



The above figure shows an electric kettle. X is connected to the live wire, Y is connected to the neutral wire, and Z is connected to the Earth wire.

(a) If the fuse is connected to the neutral wire, what is the potential hazard ? (1 mark)

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(b) The kettle has rating values of "240 V, 2000 W". What is the actual power output by the kettle if it is connected to the mains supply of Hong Kong with voltage output of 220 V ? (2 marks)

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(c) A student argues that if the switch is open, there is no current flowing in the kettle circuit. It is safe to touch any part of the circuit. Explain why the student is wrong. (2 marks)

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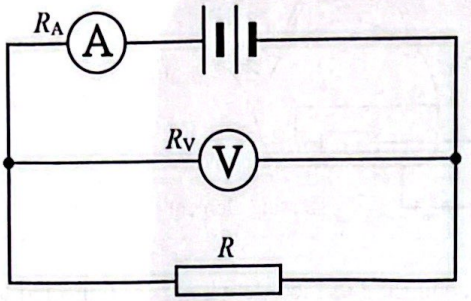
8.



The above circuit shows a method for measuring resistance using a voltmeter and an ammeter. The internal resistance of the voltmeter and the ammeter are R_V and R_A respectively and their readings V_m and I_m give the measured resistance $R_m = \frac{V_m}{I_m}$. The true resistance value of the resistor is R.

(a) State whether the measured resistance R_m is greater, smaller or equal the true resistance R. (1 mark)

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(b) Write down an equation relating R_V, R_m and R. (1 mark)

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(c) Find the percentage error associated with R_m when measuring the resistance of this resistor.

Given : $R_V = 5\ k\Omega$, $R_A = 5\ \Omega$ and $R = 1000\ \Omega$ (2 marks)

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(d) Without addition of new apparatus, suggest a simple way to reduce the percentage error of measuring the resistance of the resistor R. (1 mark)

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Answers written in the margins will not be marked.

*9. The radioisotope plutonium-238 ($^{238}_{94}Pu$) is a powerful radioactive source undergoing alpha decay as shown :

$$^{238}_{94}Pu \rightarrow {}^{234}_{92}X + {}^{4}_{2}He$$

The half-life of plutonium-238 is 87.7 years. Each alpha particle emitted carries an energy of 5.52 MeV. Suppose plutonium-238 is used in a certain radioisotope heater units, and the initial power generated is designed to be 30 kW.

(a) Find the initial activity of the plutonium-238 in the heater unit. (2 marks)

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(b) Given that the mass of one mole of plutonium-238 is 238 g, calculate the initial mass of the plutonium-238 installed in the heater unit. (2 marks)

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(c) Calculate the power generated by the heater unit after 100 years. (2 marks)

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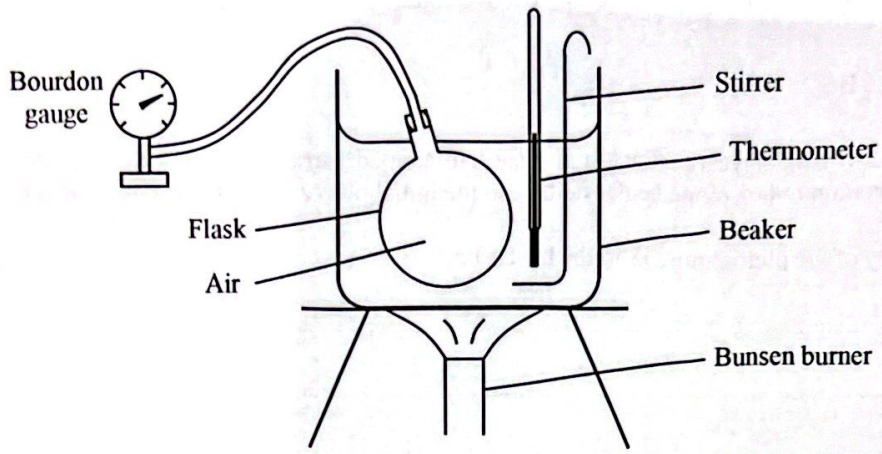
*10.



The figure above shows a flask containing air connected to a Bourdon gauge immersing in a water bath. The initial temperature of water inside the beaker is 25 °C and the corresponding Bourdon gauge reading is 105.5 kPa. The water bath is then heated by a Bunsen burner.

(a) After heating for a few minutes, the corresponding temperature and pressure should be recorded. State the precautions to take these readings. (3 marks)

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(b) Suppose the temperature recorded by the thermometer is 88 °C and the corresponding pressure recorded by the Bourdon gauge is 128.5 kPa, find the 'absolute zero' obtained in this experiment. (2 marks)

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(c) State **TWO** sources of errors in this experiment. (2 marks)

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(d) Given that the molar mass of air is 29 g, estimate the root-mean-square speed of the air molecules inside the flask when the temperature is 360 K. (2 marks)

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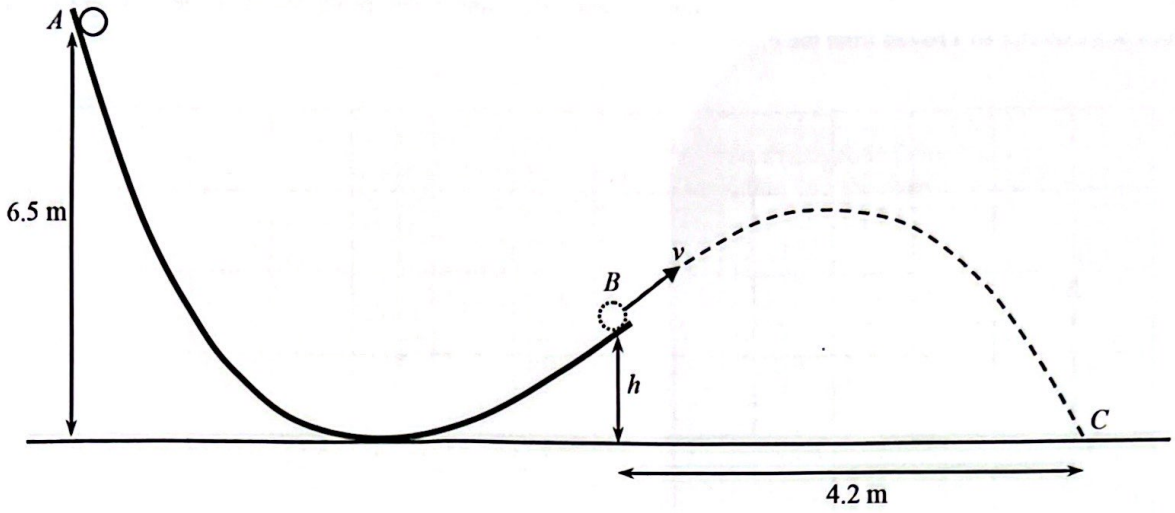
11.



A small ball of mass 0.3 kg is released from rest at point A at a height of 6.5 m above the ground. It moves down along a rough track and leaves the track at point B with velocity v at height h above the ground. The projected velocity v makes an angle of 60° with the horizontal. The ball finally reaches the ground at point C at a horizontal distance 4.2 m from B. The time of flight from B to C is 1.5 s. Air resistance is assumed negligible.

(a) By considering the projectile motion from B to C, calculate the projected speed v at the point B and the height h at B above the ground. (3 marks)

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(b) A student said that the acceleration of the small ball at the highest point is zero during its projectile motion from B to C. Comment. (1 mark)

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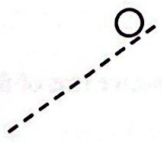
(c) In the figure below, draw and label all the forces acting on the small ball at the point B just before it leaves the inclined rough track. (2 marks)



(d) The total distance travelled by the small ball from A to B is 4.5 m. Calculate the work done against friction of the ball along the track from A to B. (2 marks)

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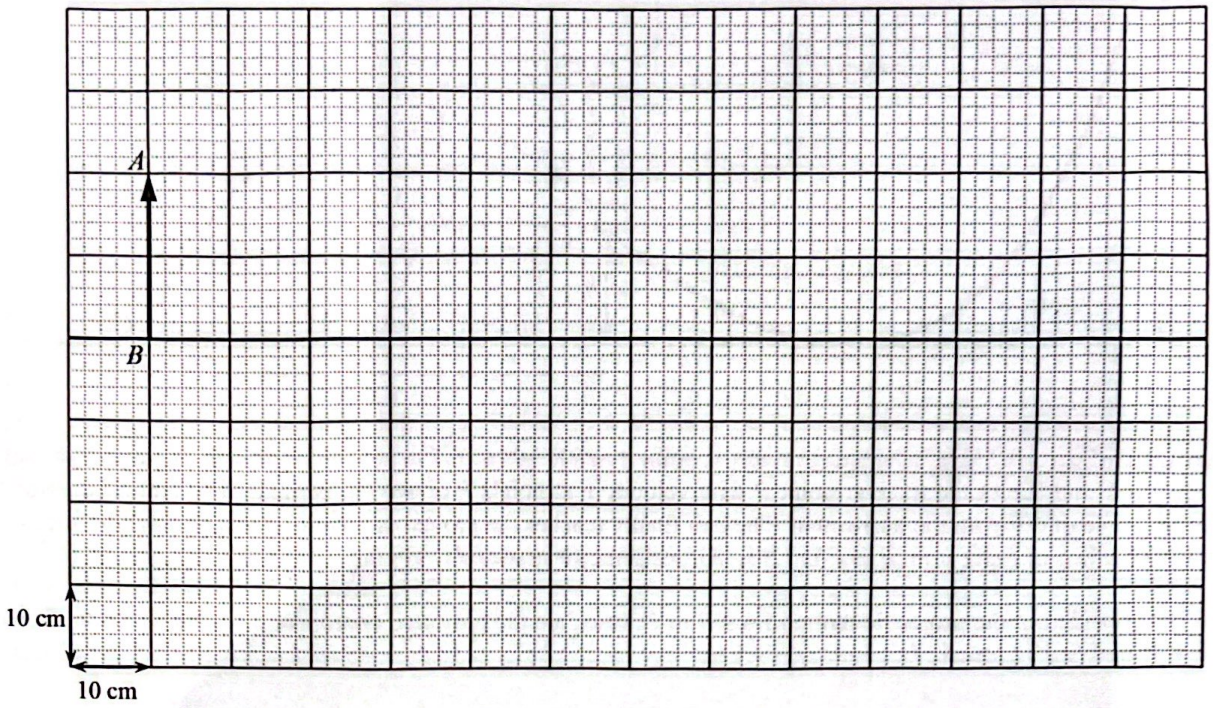
12. An object AB of height 20 cm is placed in front of a convex lens. The convex lens produces an image of height 30 cm on a screen at a distance of 110 cm from the object.



(a) On the above graph, draw

(i) the image and labelled it as $A'B'$ (1 mark)

(ii) the lens and labelled it as L (1 mark)

(b) (i) On the above graph, draw a suitable ray to indicate the position of the principal focus F. (1 mark)

(ii) Hence, write down the focal length of the convex lens. (1 mark)

Focal length of the convex lens = _____ cm

(c) Suppose the object position is fixed and now the convex lens is moved slightly away from the object.

(i) State the direction that the screen should move in order to capture the sharp image. (1 mark)

.....

(ii) What is the change of the size of the image formed on the screen ? (1 mark)

.....

*(d) In the above graph, if the convex lens is replaced by a concave lens of focal length 30 cm, with the same position of the object, calculate the image distance. (2 marks)

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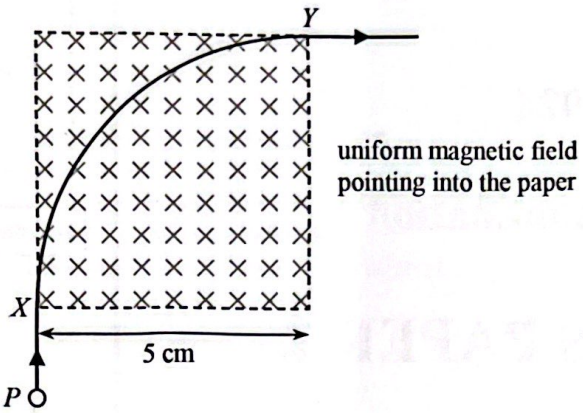
.....

.....

*13.



A charged particle P of mass 1.2×10^{-25} kg moving with speed 2.5×10^{7} m s^{-1} enters a square region of each side 5 cm with a uniform magnetic field of 0.02 T pointing into the paper as shown in the figure. The particle describes a quarter circle from X to Y and it emerges from Y with the same speed. Neglect the effects of gravity.

(a) State the sign of the charge (+ or –) carried by particle P. (1 mark)

.....

(b) Calculate the time taken for the particle P to travel from X to Y. (1 mark)

.....

.....

(c) Find the acceleration of the charged particle P inside the region of magnetic field. (2 marks)

.....

.....

.....

(d) Hence calculate the magnitude of charge carried by the particle P. (2 marks)

.....

.....

.....

(e) Explain why the particle travels with constant speed inside the region of magnetic field. (1 mark)

.....

.....

(f) By applying an electric field E to the region of magnetic field, the charged particle P can travel with a straight line from X. Determine the direction and magnitude of this electric field E. (2 marks)

.....

.....

.....

END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Hong Kong Diploma of Secondary Education Examination

Please stick the barcode label here.

Candidate Number

2024

Mock Examination

PHYSICS PAPER 2

Question-Answer Book

(1 hour)

This paper must be answered in English

INSTRUCTIONS

(1) After the announcement of the start of the examination, you should first write you Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided.

(2) This paper consists of **FOUR** sections, Section A, B, C and D. Each section contains eight multiple-choice questions and one structured question which carries 10 marks. Attempt **ALL** question in any **TWO** sections.

(3) Write your answers to the structured questions in the **ANSWER Book** provided. For multiple-choice questions, blacken the appropriate circle with an HB pencil. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

(4) Graph paper and supplementary answer sheets will be provided on request. Write your candidate number, mark the questions box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this Question-Answer Book.

(5) The Question-Answer Book and Answer Book will be collected **SEPARATELY** at the end of the examination.

(6) The diagrams in this paper are **NOT** necessarily drawn to scale.

(7) The last two pages of this Question-Answer Book contain a list of data, formulae and relationship which you may find useful.

(8) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

Section B : Atomic World

Q.2: Multiple-choice questions

2.1 Which of the following is/are the limitation of Rutherford's model of the atom, according to the classical point of view ?

(1) The atom would emit electromagnetic radiation continuously.
(2) The atom would collapse eventually.
(3) The atom would give spectrum with discrete lines.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

A	B	C	D
○	○	○	○

2.2 When a photon is absorbed by a hydrogen atom at ground state, the atom is excited to the third excited state. The frequer of the photon is

A. 2.5×10^{15} Hz
B. 3.1×10^{15} Hz
C. 4.6×10^{15} Hz
D. 5.8×10^{15} Hz

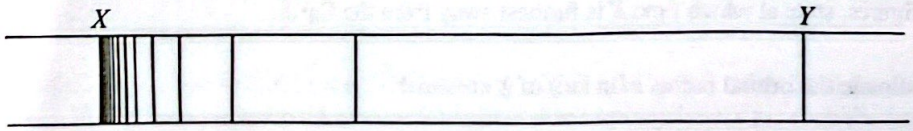
A	B	C	D
○	○	○	○

2.3 After acceleration from rest by a voltage of 18 V, an electron hits an atom to excite it from the ground state to a high energy level. After collision, the electron is scattered with speed v and the atom returns back to the ground state with t emission of a photon of wavelength 7.5×10^{-8} m. Find the speed v of the electron after collision.

A. 7.1×10^{5} m s^{-1}
B. 8.5×10^{5} m s^{-1}
C. 1.9×10^{6} m s^{-1}
D. 2.6×10^{6} m s^{-1}

A	B	C	D
○	○	○	○

2.4



The above figure shows the series of emission lines of the hydrogen spectrum associated with electron transitions fro excited energy levels to the first excited state ($n = 2$). Lines X and Y are at the two extremes ends of the series. Which the following statements are correct ?

(1) Spectral line X has the highest frequency.
(2) The wavelength of spectral line Y is 658 nm.
(3) All the spectral lines of this series is in the visible region of the electromagnetic wave spectrum.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

A	B	C	D
○	○	○	○

2.5 In a transmission electron microscope (TEM), electrons are accelerated with an anode voltage of 8 kV. If the aperture of the TEM is 2.5 cm, find the resolving power of this TEM.

A. 1.8×10^{-11} rad
B. 6.7×10^{-10} rad
C. 7.8×10^{-10} rad
D. 8.4×10^{-10} rad

A	B	C	D
○	○	○	○

2.6 Which of the following statements about nano particles is **NOT** correct ?

A. Nano particles usually have lower volume to surface area ratio than that in bulk form.
B. Nano particles are usually more reactive in chemical reaction than that in bulk form.
C. Nano particles of gold have a higher melting point than that in bulk form.
D. Nano particles are usually more efficient in serving as catalyst than that in bulk form.

A	B	C	D
○	○	○	○

2.7 The surface of a Lotus leaf contains nano-sized waxy bumps. Which of the following statements is/are correct ?

(1) The surface of a Lotus leaf is hydrophobic.
(2) The waxy bumps can be observed by using optical microscope.
(3) The surface of a Lotus leaf is always clean without any dirt.

A. (1) only
B. (3) only
C. (1) and (2) only
D. (2) and (3) only

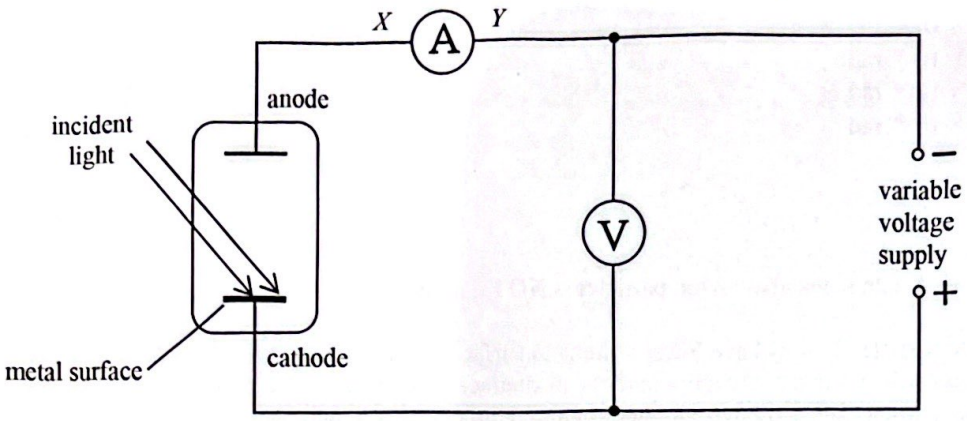
A	B	C	D
○	○	○	○

2.8 Which statements about transmission electron microscope (TEM) is **NOT** correct ?

A. TEM can reveal the internal structure of a thin piece of specimen.
B. The resolving power of TEM is limited by Rayleigh criterion.
C. In TEM imaging, the specimen must be electrically conducting.
D. Magnetic fields are used to converge electron beam in TEM.

A	B	C	D
○	○	○	○

Q.2 : Structured question



In an experiment of investigation of the photoelectric effect, monochromatic light of wavelength 450 nm is incident onto t metal surface at the cathode. The work function of the cathode is known as 1.5×10^{-19} J. A variable voltage supply connected as shown.

(a) State the direction (from X to Y **OR** from Y to X) of the current through the ammeter. **(1 mark)**

(b) Suppose the magnitude of the voltage supply is varied, sketch a graph to show how the reading of the ammeter (I) vari with the reading of the voltmeter (V). **(2 marks)**

(c) Calculate the magnitude of the voltage supply that the reading of the ammeter just drops to zero. **(2 marks)**

(d) State the change of the voltage found in part (c) if

(i) a beam of incident light with the same wavelength but higher intensity is used ; **(1 mark)**

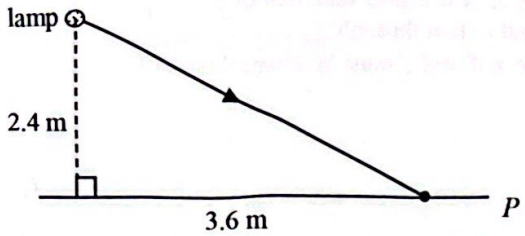
(ii) another beam of incident light with shorter wavelength but same intensity is used. **(1 mark)**

(e) Suppose the intensity of the incident light is 6 W m^{-2} and the area of the metal surface is 10 cm^2. When the anode made to be positive, a saturation current of 0.75 mA is recorded. Find the ratio of the rate of electron emission to t rate at which the photons are incident on the metal surface at the cathode. **(3 marks)**

Section C : Energy and Use of Energy

Q.3 : Multiple-choice questions

3.1



In the figure, a small lamp is at a perpendicular distance of 2.4 m above the floor inside a room. Point P on the floor is at a horizontal distance of 3.6 m from the lamp. The power rating of the lamp is 120 W and its efficacy 78 lm W^{-1}. What is the illuminance at point P ?

A. 22 lux
B. 24 lux
C. 26 lux
D. 28 lux

A B C D
○ ○ ○ ○

3.2 The table below shows the data of a house.

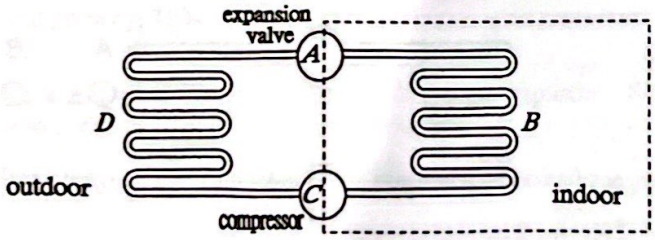
	Windows	Walls	Roof
U-value / W m^{-2} K^{-1}	7.5	2.5	2.2
Total area / m^2	100	640	120

If the Overall Thermal Transfer Value (OTTV) of the house is 22.5 W m^{-2}, calculate the average temperature difference between the interior and the exterior of the house ?

A. 6.6 °C
B. 7.0 °C
C. 7.4 °C
D. 7.8 °C

A B C D
○ ○ ○ ○

3.3



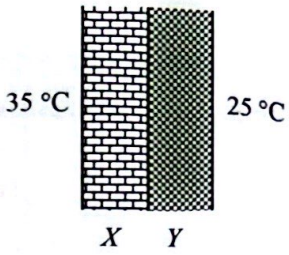
The figure above shows a simplified schematic diagram of a 'reverse-cycle air conditioner' (RCAC) with four components A, B, C and D, in which A is the expansion valve and C is the compressor. In summer, RCAC gives 'cold' to the indoor room. Which of the following concerning the RCAC is correct when it is operated in winter ?

(1) The flow of refrigerant is in the order of $ADCB$ inside the conditioner.
(2) Heat flows from the outdoor to the component D of the conditioner.
(3) The COP of the RCAC operates in winter is greater than that operates in summer.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

A B C D
○ ○ ○ ○

3.4 The figure shows a composite wall consists of two layers X and Y of equal thickness but different material. The thermal conductivity of X is higher than that of Y. The two sides of the wall are maintained at constant temperatures of 35 °C and 25 °C as shown. Which of the following statements are correct ?



(1) The thermal transmittance of the material X is higher than that of Y.
(2) The rate of heat flow through X is equal to that through Y.
(3) The temperature at the interface between X and Y must be lower than 30°C.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

A B C D
○ ○ ○ ○

3.5 The battery pack of an electric vehicle is designed to be charged by a supply voltage of 220 V with a steady d.c. current 28 A. After charging for a duration time of 13.5 hours, it can travel a mileage of 500 km. If the cost of electricity is $1.4 per kilowatt-hour, what is the cost per km by using this vehicle ?

A. $ 0.20 / km
B. $ 0.24 / km
C. $ 0.28 / km
D. $ 0.32 / km

A B C D
○ ○ ○ ○

3.6 Uranium-235 can undergo fission to give out energy. Each fission of a U-235 nucleus can give out 200 MeV of fissio energy. The efficiency of energy conversion from fission energy to electrical energy is 35%. Given that the uranium fu rod contains 8% U-235, what is the mass of uranium fuel rod consuned in 1 day to generate an electrical power of 7500 M in a nuclear plant ?

A. 125 kg
B. 282 kg
C. 369 kg
D. 537 kg

A B C D
○ ○ ○ ○

3.7 A wind turbine consists of 3 blades, each of length 22.5 m. Suppose wind blows normally towards a this wind turbine speed of 4.5 m s^{-1} for two minutes, and the wind speed changes to 3.5 m s^{-1} for another three minutes. Given that density air is 1.2 kg m^{-3}. If the average power output in this five minutes is 22.4 kW, what is the overall efficiency of th generator ?

A. 30%
B. 33%
C. 38%
D. 42%

A B C D
○ ○ ○ ○

3.8 In nuclear reactor, a U-235 nucleus undergoes fission by a neutron and breaks into two daughter nuclei, Ba-144 and Kr-90.

$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{144}_{56}Ba + {}^{90}_{36}Kr + 2\,{}^{1}_{0}n$$

Which of the following statements are correct ?

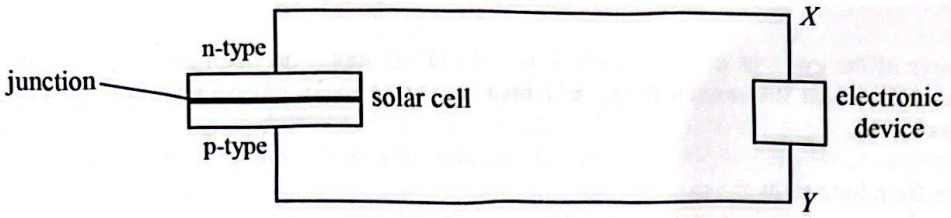
(1) There is energy release during the fission of U-235.
(2) The binding energy of a U-235 nucleus is greater than the sum of binding energy of a Ba-144 nucleus and that of Kr-90.
(3) The binding energy per nucleon of Kr-90 nucleus is higher than the binding energy per nucleon of Ba-144 nucleus.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

A B C D
○ ○ ○ ○

Q.3 : Structured question

(a)



The figure shows a simple structure of a solar cell. It consists of a p-type layer and a n-type layer joining together to form a thin junction between the two layers. Due to the movement of electrons and holes, an intrinsic electric field is developed inside the junction. The solar cell is connected to an electronic device in the external circuit as shown.

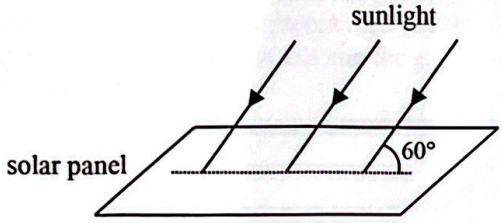
(i) State the direction of the electric field inside the junction (from p-type to n-type **OR** from n-type to p-type). (1 mark)

(ii) When sunlight shines onto the solar cell, describe how current can be given out by the solar cell. (2 marks)

(iii) State the direction of electrical current flowing through the device (from *X* to *Y* **OR** from *Y* to *X*). (1 mark)

(iv) Solar cells always appear dark in colour. State the reason behind. (1 mark)

(b) Solar cells are joined together to form solar panel. A rectangular solar panel has a surface with dimension of 2.5 m and 6.4 m as shown in the figure below. On a certain day, the atmosphere absorbs an average amount of 42% of solar intensity. Sunlight are then incident onto the solar panel at an angle of 60° with the panel surface. Solar constant is 1380 W m^{-2}.



(i) Give the meaning of the solar constant. (1 mark)

(ii) Calculate the electrical energy output by this solar panel in one hour if the conversion efficiency from light power to electrical power is 16%. (2 marks)

(c) Both solar power and wind power are renewable energy resources. State ONE advantage and ONE disadvantage of using solar power, compared with that of wind power. (2 marks)