Neap

Trial Examination 2022

HSC Year 12 Physics

General Instructions	
	• Reading time – 5 minutes • Working time – 3 hours • Write using black pen • Draw diagrams using pencil • Calculators approved by NESA may be used • A data sheet, formulae sheet and Periodic Table are provided at the back of this paper
Total marks: 100	SECTION I – 20 marks (pages 2–10) • Attempt Questions 1–20 • Allow about 35 minutes for this section SECTION II – 80 marks (pages 11–30) • Attempt Questions 21–33 • Allow about 2 hours and 25 minutes for this section

SECTION I

20 marks
Attempt Questions 1–20
Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

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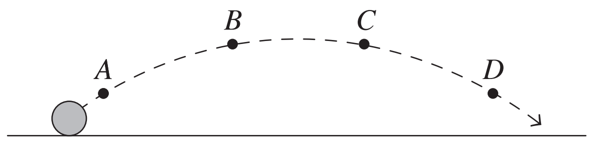
1 A field hockey player scoops the ball up and over opposing players to pass to their teammate further up the field. The ball moves from position *A* to position *D*, as shown in the diagram.



At which position(s) would the acceleration of the ball be vertically downward?

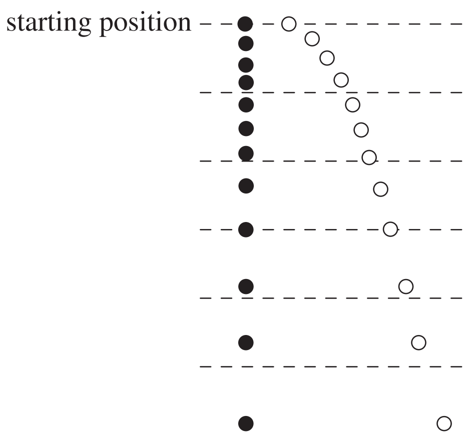
A. *D* only

B. *C* and *D* only

C. *B*, *C* and *D* only

D. *A*, *B*, *C* and *D*

2 Two balls were simultaneously released from the same starting position. The black ball was dropped from rest and the white ball was projected horizontally, as shown in the diagram. The dashed lines represent equal distance intervals.



Which row of the table identifies the relative motions of the balls?

	X position of the balls	*Y position of the balls*	*Y velocities of the balls*	*X velocities of the balls*	*Y acceleration of the balls*
A.	different	same	same	different	same
B.	same	same	same	same	same
C.	different	different	different	different	different
D.	different	same	same	different	different

3 A National Aeronautics and Space Administration (NASA) scientist uses a simulator to model the surface gravity of four different bodies in the Solar System. The surface gravity of each body is shown in the table.

Body	*Surface gravity (m s^{-2})*
Ceres	5.55
Icarus	0.38
Hermes	4.97
Pallas	2.49

In the first simulation, the scientist throws a small cube with a mass of 450 g upwards. The cube initially travels at a speed of 6.5 m s^{-1} and reaches a maximum height of 8.5 m.

Which body is the scientist simulating?

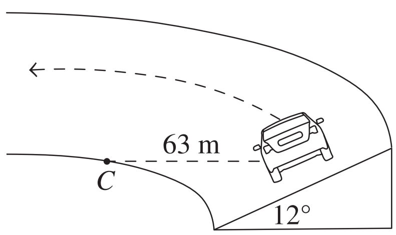
A. Ceres

B. Icarus

C. Hermes

D. Pallas

4 A road has a curve of radius 63 m and is banked at an angle of 12°. The diagram shows a car approaching the curve in wet, slippery conditions.



Assuming that there is no friction, calculate the maximum speed at which the car can safely make the turn.

A. 6.07 km h^{-1}

B. 11.5 km h^{-1}

C. 36.5 km h^{-1}

D. 41.2 km h^{-1}

5 What will be produced when white light is passed through a gaseous sample of an element and examined with a spectrometer?

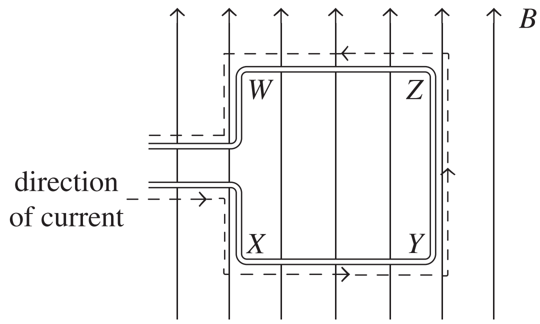
A. an absorption spectrum that is shown as a series of dark lines on a coloured background

B. an emission spectrum that is shown as a series of coloured lines on a dark background

C. an absorption spectrum that is shown as a series of coloured lines on a dark background

D. an emission spectrum that is shown as a series of dark lines on a coloured background

6 Consider the current-carrying loop.



How is torque created in the current-carrying loop?

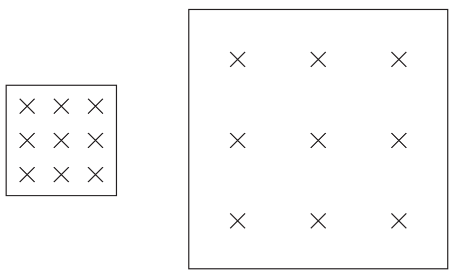
A. There is a force on *WZ* out of the page and a force on *XY* into the page.

B. There is a force on *WZ* into the page and a force on *XY* out of the page.

C. There is a force on *WZ* out of the page and a force on *XY* out of the page.

D. There is a force on *WZ* into the page and a force on *XY* into the page.

7 A Physics teacher drew two magnetic fields and asked their students to explain the difference between the magnetic flux of each field. The two magnetic fields are shown in the diagram.



Which of the following statements is correct?

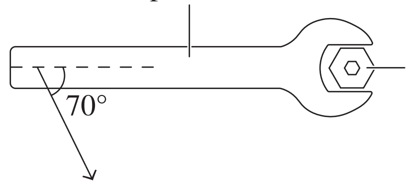
A. The two magnetic fields show the same amount of flux, and the smaller magnetic field shows less flux density.

B. The two magnetic fields show different amounts of flux, and the smaller magnetic field shows less flux density.

C. The two magnetic fields show different amounts of flux, and the smaller magnetic field shows greater flux density.

D. The two magnetic fields show the same amount of flux, and the smaller magnetic field shows greater flux density.

8 In cycling, it is important for the nuts on bike seats to be tightened appropriately so they do not come loose during a race. Before a race, a cyclist tightened the nuts with a 50.0 cm spanner and applied a force of 70.0 N at an angle of 70° to the spanner, as shown in the diagram.



What magnitude of torque has the cyclist applied to the nut?

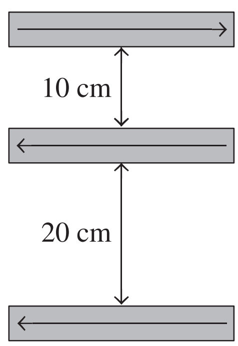
A. 11.97 N m

B. 32.89 N m

C. 1197.07 N m

D. 3289.92 N m

9 The diagram shows a set-up that uses three rods (A–C), each carrying a current in the direction indicated by the arrows.



What is the magnitude and direction of the force per unit length on rod C?

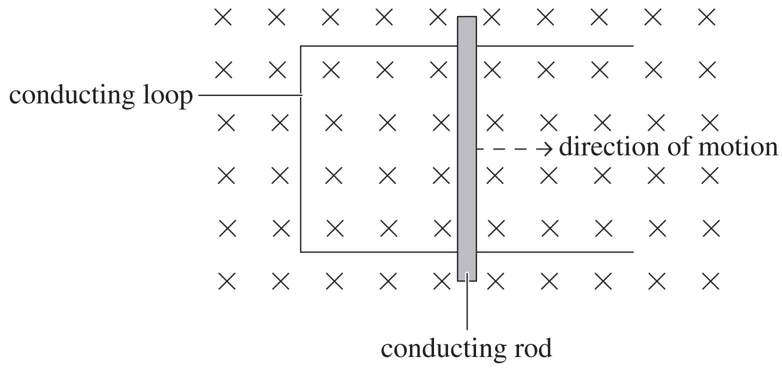
A. 1×10^{-5} N m^{-1} down

B. 1×10^{-5} N m^{-1} up

C. 3×10^{-5} N m^{-1} up

D. 3×10^{-5} N m^{-1} down

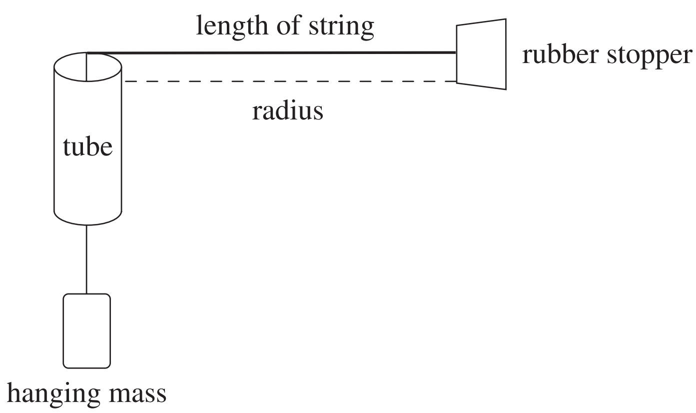
10 A conducting rod slides along a metal conducting loop, as shown in the diagram.



Which row of the table is correct?

	Direction of force on the conducting rod	*Direction of induced current in the rod*	*Direction of current around the conducting loop*
A.	to the left	up the rod	anticlockwise
B.	to the left	down the rod	clockwise
C.	to the right	up the rod	anticlockwise
D.	to the right	down the rod	clockwise

11 A student carries out an investigation to find the relationship between the centripetal force, rotational speed and radius of an object moving in a uniform, circular motion. The student attaches a rubber stopper to a hanging mass using a string that passes through a tube and swings the rubber stopper around the tube, as shown in the diagram. As the rubber stopper is swung, the hanging mass rises and falls depending on the rotational speed of the stopper. When the hanging mass neither rises nor falls, the radius of the stopper is measured.



Which row of the table identifies the variables for this investigation?

	Independent variable	*Dependent variable*	*Controlled variables*
A.	hanging mass	length of string	mass of rubber stopper, rotational speed
B.	rotational speed	length of string	hanging mass, rotational speed
C.	mass of rubber stopper	rotational speed	hanging mass, length of string
D.	rotational speed	radius	mass of rubber stopper, length of string

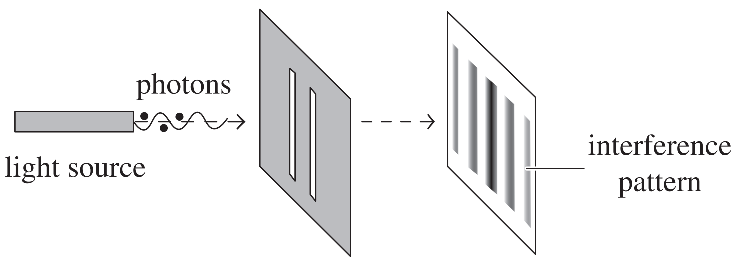
12 As a star rotates, the observed atomic absorption bands change. Consider the statement about this relationship.

> When a star is rotating away from an observer, light is ______*X*______. When the star is rotating towards the observer, light is ______*Y*______. The ______*Z*______ it rotates, the wider the absorption band will appear in its spectrum.

Which row of the table completes the statement?

	X	*Y*	*Z*
A.	blue-shifted	red-shifted	faster
B.	red-shifted	blue-shifted	faster
C.	blue-shifted	red-shifted	slower
D.	red-shifted	blue-shifted	slower

13 Young performed an experiment where photons were beamed through a double-slit onto a screen, as shown in the diagram.



The following changes were made one at a time.

Change 1: The slit separation is changed.

Change 2: The distance between the double-slit and the screen is increased.

Which row of the table identifies what will occur after each change?

	Change 1	*Change 2*
A.	If the slit separation increases, the spacing between the bright bands decreases.	The spacing between the bright bands decreases.
B.	If the slit separation increases, the spacing between the bright bands decreases.	The spacing between the bright bands increases.
C.	If the slit separation increases, the spacing between the bright bands increases.	The spacing between the bright bands increases.
D.	If the slit separation decreases, the spacing between the bright bands increases.	The spacing between the bright bands decreases.

14 Light passes through a diffraction grating with a slit separation of 0.07 mm. An interference pattern is shown on a screen placed 105 cm from the grating. Six of the bright bands have a separation of 50 mm.

What is the wavelength of the light?

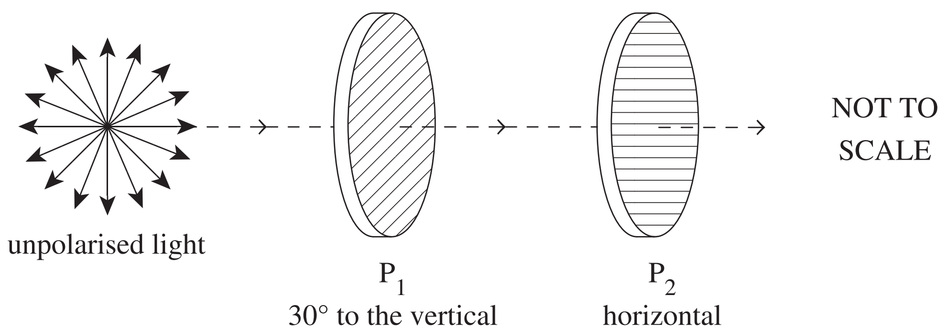
A. 5.55 nm

B. 6.66 nm

C. 555 nm

D. 666 nm

15 A light meter measures 150 Wm^{-2} of unpolarised light at a fixed position from a light source. A polarising sheet, P_1, is placed at this position with an axis of polarisation 30° to the vertical. A second polarising sheet, P_2, is placed so that any light that passes through P_1 also passes through the P_2. P_2 has an axis of polarisation oriented horizontally. The diagram shows the set-up.



What intensity of light is transmitted through P_2?

A. 9.38 Wm^{-2}

B. 18.75 Wm^{-2}

C. 37.5 Wm^{-2}

D. 75 Wm^{-2}

16 Most stars have at least one planet orbiting them. Two planets, Psi and Tri, have been observed to orbit a star. Psi has an orbital path with a radius that is four times smaller than the radius of Tri's orbital path.

Which of the following statements about Psi and Tri is correct?

A. Tri would take 8 times longer than Psi to make a full orbit of the star.

B. Psi would take 8 times longer than Tri to make a full orbit of the star.

C. Tri would take 64 times longer than Psi to make a full orbit of the star.

D. Psi would take 64 times longer than Tri to make a full orbit of the star.

17 A Geiger–Muller counter is an instrument that emits a beep every time a beta particle is detected. A radioactive sample that emits beta radiation, *X*, gives a reading of 2.3 counts per minute on the Geiger–Muller counter. Sample *Y* is taken from the same element as sample *X*, but has a more recent origin. Sample *Y* gives a reading of 18.4 counts per minute.

If the half-life of the element is 356 years, how much older than sample *Y* is sample *X*?

A. 25 years

B. 119 years

C. 1068 years

D. 15 065 years

18 Stars go through a lifecycle.

Which of the following lists the stages of a star's lifecycle in chronological order?

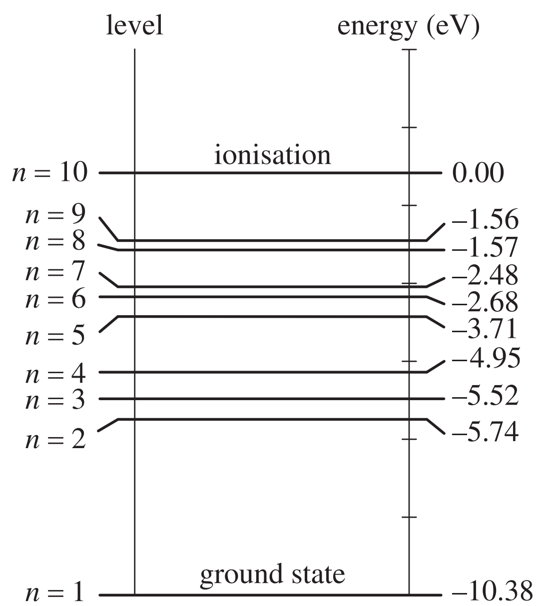
A. protostar, nebula, main sequence star, neutron star, red giant

B. nebula, protostar, main sequence star, red giant, black hole

C. protostar, nebula, main sequence star, red supergiant, white dwarf

D. nebula, protostar, main sequence star, red giant, neutron star

19 The energy level diagram for mercury is shown.



What frequency of light would be emitted as an electron falls from the $n = 5$ state to the $n = 3$ state?

A. 1.81 eV

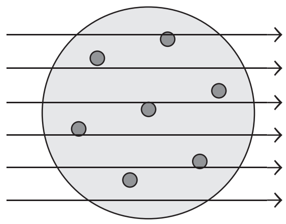
B. 2.89×10^{-19} J

C. 4.4×10^{14} Hz

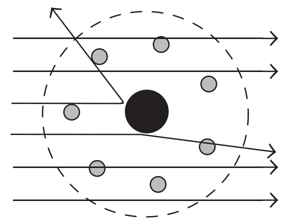
D. 7.4×10^{14} Hz

20 The following schematic diagrams represent two models of the atom, one of which was proposed by Ernest Rutherford and the other by Joseph Thomson.

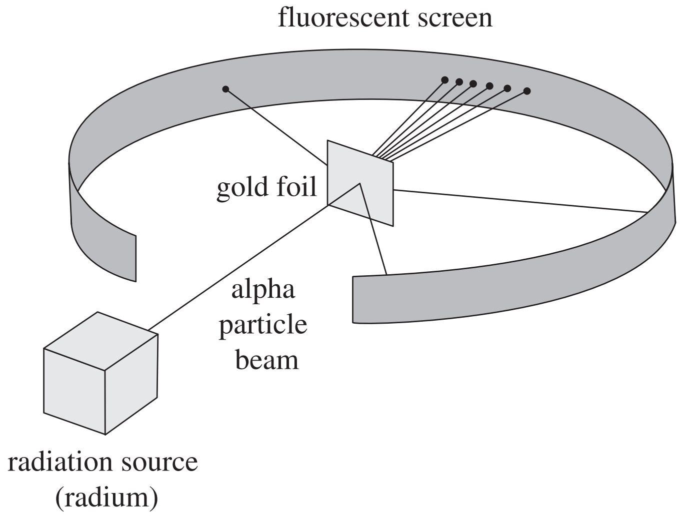
Model 1



Model 2



Geiger and Marsden were asked by Rutherford to test Thomson's model of the atom. The experiment shown in the diagram below was carried out in a vacuum.



Which row of the table identifies the atomic model of each scientist and explains the results obtained by Geiger and Marsden?

	Thomson's model and explanation	*Rutherford's model and explanation*
A.	Model 1 Some alpha particles go through the gold foil undeflected as they are attracted to the positive particles scattered throughout the atom.	Model 2 Most alpha particles are deflected as they hit the positively charged nucleus inside the mostly empty atom.
B.	Model 1 Most alpha particles go through the gold foil undeflected as they are attracted to the negative particles scattered throughout the atom.	Model 2 Some alpha particles are deflected as they hit the positively charged nucleus inside the mostly empty atom.
C.	Model 2 Most alpha particles are deflected as they hit the positively charged nucleus inside the mostly empty atom.	Model 1 Some alpha particles go through the gold foil undeflected as they are attracted to the positive particles scattered throughout the atom.
D.	Model 2 Some alpha particles are deflected as they hit the positively charged nucleus inside the mostly empty atom.	Model 1 Most alpha particles go through the gold foil undeflected as they are attracted to the negative particles scattered throughout the atom.

HSC Year 12 Physics

Section II Answer Booklet

Section II

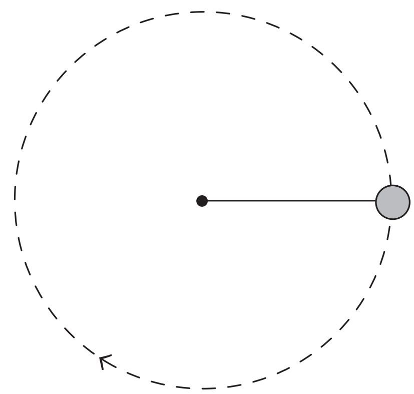
80 marks
Attempt Questions 21–33
Allow about 2 hours and 25 minutes for this section

Instructions	
	• Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response. • Show all relevant working in questions involving calculations. • Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 21 (5 marks)

The diagram shows a totem tennis set-up, as viewed from above. A tennis ball is tied to a pole with a cord so that it moves in a clockwise, circular motion around the centre pole.



(a) Label the velocity of the ball and the forces acting on it at the point shown in the diagram above. Explain your answer. **2**

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(b) The ball has a mass of 60.0 g and the cord is 1.80 m long. The ball rotates around the centre pole at an angle of 45° to the pole. **1**

Calculate the radius of the ball's circular path.

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Question 21 continues on page 13

Question 21 (continued)

(c) Determine the magnitude of the net force acting on the ball at the point shown. **2**

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End of Question 21

Question 22 (3 marks)

A student kicks a ball at a speed of 8.3 m s^{-1} at an angle of 35° above the ground. **3**

What is the range of the ball?

Question 23 (4 marks)

A communications company launched a satellite of mass 250 kg. The satellite is in an orbit with a uniform circular radius of 33 500 km around Earth. **4**

Calculate the gravitational potential energy of the satellite and its escape velocity. In your response, explain what the term 'escape velocity' means.

Question 24 (8 marks)

(a) Supertankers are large cargo ships that often transport oil. The supertankers *TI Europe* and *TI Oceania* are two of the largest man-made objects. They float with their centres 100.00 m apart and each has mass of 5.00×10^8 kg. **2**

Calculate the gravitational force between the two supertankers.

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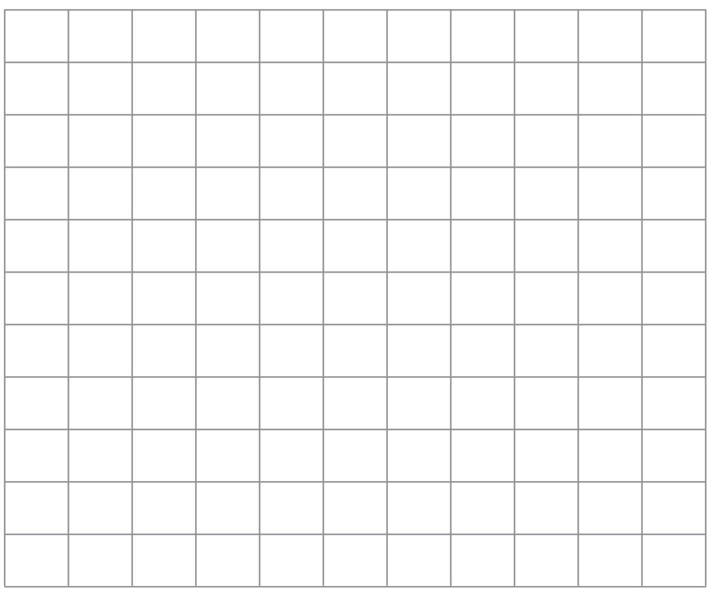
The centre of a planet of mass 1.00×10^{24} kg is a distance, *d*, from the centre of one of its moons. The table shows the gravitational force of attraction between the planet and this moon.

$F\ (\times 10^3\ N)$	37	32	23	17	11	6
$d\ (\times 10^6\ m)$	3.43	3.70	4.34	5.06	6.32	8.45
$\frac{1}{d^2}\ (\times 10^{-14}\ m^{-2})$	8.5	7.3	5.3	3.9	2.5	1.4

(b) Plot the graph of *F* versus $\frac{1}{d^2}$. **3**



Question 24 continues on page 16

Question 24 (continued)

(c) Find the gradient of the graph drawn in part (b) and use the relationship $F = \frac{k}{d^2}$ to determine the mass of the moon. **3**

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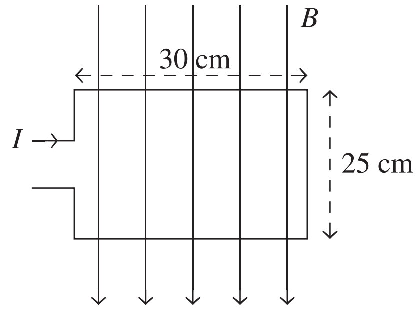
End of Question 24

Question 25 (9 marks)

The diagram shows the wire loop of a motor in a magnetic field. The loop carries a current of 8 A and the magnetic field intensity is 0.025 T.



(a) Compare the structural features and physics principles that are involved in DC motors and AC induction motors to explain how the motor effect is used in both motors. **5**

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(b) Calculate the magnitude of the torque experienced by the wire loop. **2**

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Question 25 continues on page 18

Question 25 (continued)

(c) Identify TWO modifications to the wire loop that would increase the torque. Explain your answer. **2**

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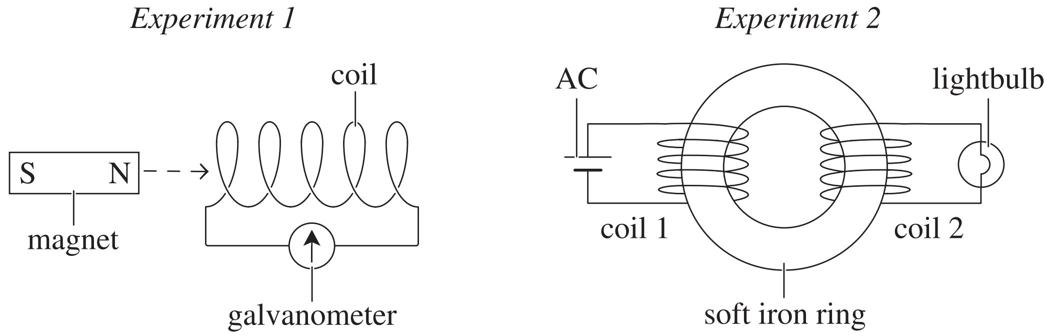
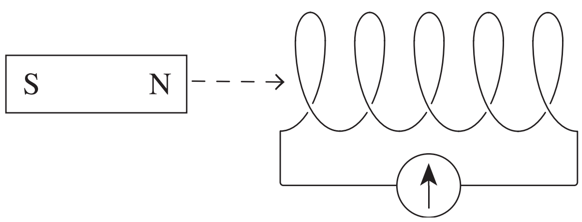
End of Question 25

Question 26 (5 marks)

Scientists including Faraday and Lenz investigated the relationship between electricity and magnetism through a series of experiments. The diagram shows the set-up of Faraday's first and second experiments.



(a) Label the diagram below to show the direction of current and induced magnetic field in experiment 1. **1**



(b) Assess the contribution of Faraday and Lenz to our understanding of how electric and magnetic fields are related in terms of the Law of Conservation of Energy. Refer to the diagrams in your response. **4**

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Question 27 (3 marks)

For electricity to be transmitted over the large distances between generators and households, transformers are used. Two transmissions take place over the same transmission lines. **3**

- In transmission A, energy is transmitted at 28 kV AC.
- In transmission B, the same amount of energy is transmitted at 280 kV AC.

Compare the power losses that occur in transmissions A and B. Include relevant equations and calculations in your response.

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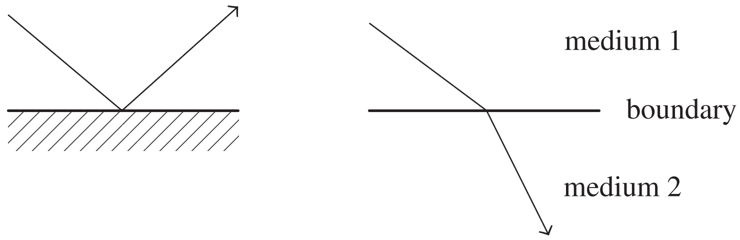
Question 28 (9 marks)

'Prior to the twentieth century, physicists developed theories and models under the banner of classical physics that were able to make predictions. However, developments in the twentieth century saw these models and theories being challenged by quantum physics.' **9**

Analyse this statement with reference to the photoelectric effect and the work of Bohr, de Broglie and Schrödinger.

Question 29 (4 marks)

Two theories of light were proposed by Newton and Huygens in in the seventeenth century: the corpuscular theory and the wave theory. Two properties of light are depicted in the diagrams. **4**



Analyse the evidence, including the determination of the speed of light, that supported the two models. In your response, make reference to the properties shown in the diagrams.

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Question 30 (6 marks)

Einstein used thought experiments to explain how the behaviour of light affects the concepts of time, space and matter.

(a) The rest life, or proper lifetime, of a meson is 2.5×10^{-8} s. An observer measures the distance travelled by a meson moving at 2.95×10^{8} m s^{-1} in the laboratory. **3**

Compare the expected distance travelled by the meson in the absence of time dilation with the distance that would be measured by the observer.

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(b) A spacecraft of mass 79 000 kg is moving at 0.3*c*. **3**

Compare the mass of the spacecraft measured by the spacecraft's pilot with the mass measured by an external observer, and explain why objects cannot accelerate to the speed of light.

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Question 31 (8 marks)

In science, there is a close link between developments in technology and developments in knowledge and understanding. **8**

Evaluate how the invention of particle accelerators has advanced our understanding of atoms and provided evidence that supports the Standard Model of matter.

Question 32 (10 marks)

(a) As part of the Physics course, you have modelled the process of nuclear fission. **4**

Explain the difference between a controlled and uncontrolled fission chain reaction. In your response, refer to the model you studied.

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(b) Information about an oxygen-18 atom is given in the table. **3**

Mass of atom	17.99916 amu
Mass of proton	1.007276 amu
Mass of neutron	1.008664 amu

Calculate the mass defect of the nucleus of an oxygen-18 atom and provide its binding energy in joules AND electron volts.

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Question 32 continues on page 26

Question 32 (continued)

(c) Identify and describe a balanced nucleosynthesis reaction that can be used to explain how energy is released by nuclear fusion in cooler main sequence stars. **3**

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End of Question 32

 TEN_Y12_Phys_QB_2022

Question 33 (6 marks)

Experimental evidence was gathered by scientists to support the existence of the electron.

(a) As part of the Physics course, you have investigated the early experiments examining the nature of cathode rays. **2**

Complete the table below by describing TWO observations from these experiments and explaining how the observed behaviour of the cathode rays supported the existence and properties of the electron. Your response may include diagrams.

Observation	*Explanation*

Question 33 continues on page 28

Question 33 (continued)

(b) In an experiment involving an evacuated gas tube, electrons were accelerated from rest through a voltage of 2400 V. They entered a uniform magnetic field strength of 1.8×10^{-3} T at right angles to the electron beam. **2**

Calculate the speed of these electrons upon entering the magnetic field.

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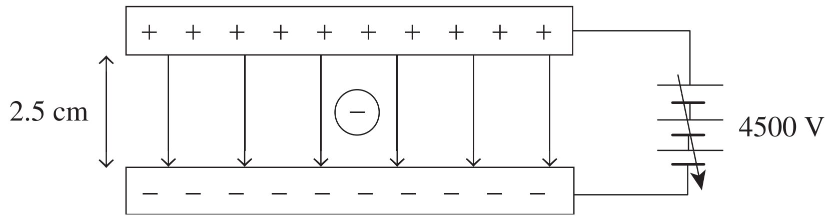
(c) In science, observations lead to hypotheses and further experimentation. **2**

Robert Millikan conducted experiments to determine the charge on an electron. One of these experiments is shown in the diagram.



Explain the observations Millikan made that led to his determination of the charge of an electron.

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Section II extra writing space

If you use this space, clearly indicate which question you are answering.

DATA SHEET

Charge on electron, q_e	-1.602×10^{-19} C
Mass of electron, m_e	9.109×10^{-31} kg
Mass of neutron, m_n	1.675×10^{-27} kg
Mass of proton, m_p	1.673×10^{-27} kg
Speed of sound in air	340 ms^{-1}
Earth's gravitational acceleration, g	9.8 ms^{-2}
Speed of light, c	3.00×10^{8} ms^{-1}
Electric permittivity constant, ε_0	8.854×10^{-12} A^2 s^4 kg^{-1} m^{-3}
Magnetic permeability constant, μ_0	$4\pi \times 10^{-7}$ N A^{-2}
Universal gravitational constant, G	6.67×10^{-11} N m^2 kg^{-2}
Mass of Earth, M_E	6.0×10^{24} kg
Radius of Earth, r_E	6.371×10^{6} m
Planck constant, h	6.626×10^{-34} J s
Rydberg constant, R (hydrogen)	1.097×10^{7} m^{-1}
Atomic mass unit, u	1.661×10^{-27} kg 931.5 MeV/c^2
1 eV	1.602×10^{-19} J
Density of water, ρ	1.00×10^{3} kg m^{-3}
Specific heat capacity of water	4.18×10^{3} J kg^{-1} K^{-1}
Wien's displacement constant, b	2.898×10^{-3} m K

FORMULAE SHEET

Motion, forces and gravity

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

$v = u + at$

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

$\vec{F}_{\text{net}} = m\vec{a}$

$\Delta U = mg\Delta h$

$W = F_{\parallel}s = Fs\cos\theta$

$P = \frac{\Delta E}{\Delta t}$

$K = \frac{1}{2}mv^2$

$\sum \frac{1}{2}mv^2_{\text{before}} = \sum \frac{1}{2}mv^2_{\text{after}}$

$P = F_{\parallel}v = Fv\cos\theta$

$\Delta\vec{p} = \vec{F}_{\text{net}}\Delta t$

$\sum m\vec{v}_{\text{before}} = \sum m\vec{v}_{\text{after}}$

$\omega = \frac{\Delta\theta}{t}$

$a_c = \frac{v^2}{r}$

$\tau = r_{\perp}F = rF\sin\theta$

$F_c = \frac{mv^2}{r}$

$v = \frac{2\pi r}{T}$

$F = \frac{GMm}{r^2}$

$U = -\frac{GMm}{r}$

$\frac{r^3}{T^2} = \frac{GM}{4\pi^2}$

Waves and thermodynamics

$v = f\lambda$

$f_{\text{beat}} = |f_2 - f_1|$

$f = \frac{1}{T}$

$f' = f\frac{(v_{\text{wave}} + v_{\text{observer}})}{(v_{\text{wave}} - v_{\text{source}})}$

$d\sin\theta = m\lambda$

$n_1\sin\theta_1 = n_2\sin\theta_2$

$n_x = \frac{c}{v_x}$

$\sin\theta_c = \frac{n_2}{n_1}$

$I = I_{\max}\cos^2\theta$

$I_1r_1^2 = I_2r_2^2$

$Q = mc\Delta T$

$\frac{Q}{t} = \frac{kA\Delta T}{d}$

FORMULAE SHEET (continued)

Electricity and magnetism

$$E = \frac{V}{d}$$

$$\vec{F} = q\vec{E}$$

$$V = \frac{\Delta U}{q}$$

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$

$$W = qV$$

$$I = \frac{q}{t}$$

$$W = qEd$$

$$V = IR$$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$P = VI$$

$$B = \frac{\mu_0 N I}{L}$$

$$F = qv_{\perp}B = qvB\sin\theta$$

$$\Phi = B_{\parallel}A = BA\cos\theta$$

$$F = lI_{\perp}B = lIB\sin\theta$$

$$\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$$

$$\frac{F}{l} = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{r}$$

$$\frac{V_{\mathrm{p}}}{V_{\mathrm{s}}} = \frac{N_{\mathrm{p}}}{N_{\mathrm{s}}}$$

$$\tau = nIA_{\perp}B = nIAB\sin\theta$$

$$V_{\mathrm{p}}I_{\mathrm{p}} = V_{\mathrm{s}}I_{\mathrm{s}}$$

Quantum, special relativity and nuclear

$$\lambda = \frac{h}{mv}$$

$$t = \frac{t_0}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}}$$

$$K_{\max} = hf - \phi$$

$$l = l_0\sqrt{\left(1 - \frac{v^2}{c^2}\right)}$$

$$\lambda_{\max} = \frac{b}{T}$$

$$p_{\mathrm{v}} = \frac{m_0 v}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}}$$

$$E = mc^2$$

$$E = hf$$

$$N_{\mathrm{t}} = N_0 e^{-\lambda t}$$

$$\frac{1}{\lambda} = R\left(\frac{1}{n_{\mathrm{f}}^2} - \frac{1}{n_{\mathrm{i}}^2}\right)$$

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

PERIODIC TABLE OF THE ELEMENTS

KEY

atomic number	79
symbol	Au
standard atomic weight	197.0
name	gold

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H 1.008 hydrogen																	2 He 4.003 helium
3 Li 6.941 lithium	4 Be 9.012 beryllium											5 B 10.81 boron	6 C 12.01 carbon	7 N 14.01 nitrogen	8 O 16.00 oxygen	9 F 19.00 fluorine	10 Ne 20.18 neon
11 Na 22.99 sodium	12 Mg 24.31 magnesium											13 Al 26.98 aluminium	14 Si 28.09 silicon	15 P 30.97 phosphorus	16 S 32.07 sulfur	17 Cl 35.45 chlorine	18 Ar 39.95 argon
19 K 39.10 potassium	20 Ca 40.08 calcium	21 Sc 44.96 scandium	22 Ti 47.87 titanium	23 V 50.94 vanadium	24 Cr 52.00 chromium	25 Mn 54.94 manganese	26 Fe 55.85 iron	27 Co 58.93 cobalt	28 Ni 58.69 nickel	29 Cu 63.55 copper	30 Zn 65.38 zinc	31 Ga 69.72 gallium	32 Ge 72.64 germanium	33 As 74.92 arsenic	34 Se 78.96 selenium	35 Br 79.90 bromine	36 Kr 83.80 krypton
37 Rb 85.47 rubidium	38 Sr 87.61 strontium	39 Y 88.91 yttrium	40 Zr 91.22 zirconium	41 Nb 92.91 niobium	42 Mo 95.96 moybdenum	43 Tc technetium	44 Ru 101.1 ruthenium	45 Rh 102.9 rhodium	46 Pd 106.4 palladium	47 Ag 107.9 silver	48 Cd 112.4 cadmium	49 In 114.8 indium	50 Sn 118.7 tin	51 Sb 121.8 antimony	52 Te 127.6 tellurium	53 I 126.9 iodine	54 Xe 131.3 xenon
55 Cs 132.9 caesium	56 Ba 137.3 barium	57–71 lanthanoids	72 Hf 178.5 hafnium	73 Ta 180.9 tantalum	74 W 183.9 tungsten	75 Re 186.2 rhenium	76 Os 190.2 osmium	77 Ir 192.2 iridium	78 Pt 195.1 platinum	79 Au 197.0 gold	80 Hg 200.6 mercury	81 Tl 204.4 thallium	82 Pb 207.2 lead	83 Bi 209.0 bismuth	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89–103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	111 Cn copernicium	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Ts tennessine	118 Og oganesson

Lathanoids

57 La 138.9 lanthanum	58 Ce 140.1 cerium	59 Pr 140.9 praseodymium	60 Nd 144.2 neodymium	61 Pm promethium	62 Sm 150.4 samarium	63 Eu 152.0 europium	64 Gd 157.3 gadolinium	65 Tb 158.9 terbium	66 Dy 162.5 dysprosium	67 Ho 164.9 holmium	68 Er 167.3 erbium	69 Tm 168.9 thulium	70 Yb 173.1 ytterbium	71 Lu 175.0 lutetium

Actinoids

89 Ac actinium	90 Th 232.0 thorium	91 Pa 231.0 protactinium	92 U 238.0 uranium	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium

Standard atomic weights are abridged to four significant figures.
Elements with no reported values in the table have no stable nuclides.
Information on elements with atomic numbers 113 and above is sourced from the International Union of Pure and Applied Chemistry Periodic Table of the Elements (November 2016 version).
The International Union of Pure and Applied Chemistry Periodic Table of the Elements (February 2010 version) is the principal source of all other data. Some data may have been modified.

Neap

Trial Examination 2022

HSC Year 12 Physics

DIRECTIONS:

Write your name in the space provided.
Write your student number in the boxes provided below. Then, in the columns of digits below each box, fill in the oval which has the same number as you have written in the box. Fill in **one** oval only in each column.
Read each question and its suggested answers. Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely, using blue or black pen. Mark only **one** oval per question.

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and draw an arrow as follows.

correct ↓

A ⊗ B ⊗ C ○ D ○

STUDENT NAME: ______________________________

STUDENT NUMBER:

1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0

SECTION I
MULTIPLE-CHOICE ANSWER SHEET

1.	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○
11.	A ○	B ○	C ○	D ○
12.	A ○	B ○	C ○	D ○
13.	A ○	B ○	C ○	D ○
14.	A ○	B ○	C ○	D ○
15.	A ○	B ○	C ○	D ○
16.	A ○	B ○	C ○	D ○
17.	A ○	B ○	C ○	D ○
18.	A ○	B ○	C ○	D ○
19.	A ○	B ○	C ○	D ○
20.	A ○	B ○	C ○	D ○

STUDENTS SHOULD NOW CONTINUE WITH SECTION II