Neap

Trial Examination 2021

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 2–8)

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

Section II – 80 marks (pages 9–29)

- Attempt Questions 21–37
- Allow about 2 hours and 25 minutes for this section

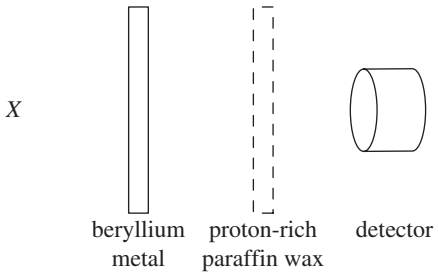
Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2021 HSC Year 12 Physics examination.

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.

1 James Chadwick discovered the neutron. He achieved this by observing the properties of the neutron, performing an experiment similar to the experiment shown in the diagram.



What is *X*?

A. alpha emitter
B. beta emitter
C. visible light
D. cathode ray

2 Which of the following is NOT a component of a DC motor?

A. magnet
B. coil
C. slip-ring commutator
D. brushes

3 The laminated iron core in a transformer

A. increases the size of eddy currents to generate more electricity.
B. reduces the size of eddy currents to improve the efficiency of the transformer.
C. reduces the size of eddy currents to increase heat energy to better control the efficiency of the transformer.
D. increases the size of eddy currents to provide a constant supply of electricity.

4 The emission spectrum of hydrogen is divided into several series.
Which series is in the visible part of the electromagnetic spectrum?

A. Lyman series
B. Paschen series
C. Rydberg series
D. Balmer series

5 The carbon-nitrogen-oxygen (CNO) cycle fuses four protons into helium in the core of stars that have a mass greater than 2×10^{30} kg.

What fundamental particle is emitted during the net process of fusion?

A. quark

B. electron

C. hydrogen atom

D. neutrino

6 A class of Physics students analysed a video of a frog jumping from a horizontal surface.

The students calculated the angle of the frog's leap to be 50° to the horizontal with a speed of 1.35 m s^{-1}.

What is the speed of the frog at its highest point?

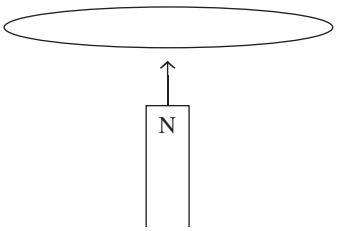
A. 0.03 m s^{-1}

B. 0.87 m s^{-1}

C. 1.35 m s^{-1}

D. 2.15 m s^{-1}

7 The North pole of a magnet is moved upwards towards a stationary horizontal coil, as shown in the diagram.



Which of the following statements is correct?

A. When viewed from above, the induced current in the coil will flow anti-clockwise.

B. When viewed from above, the induced current in the coil will flow clockwise.

C. There will be no induced current in the coil.

D. When viewed from above, the induced current in the coil will flow perpendicular to the movement of the magnet.

8 According to the Standard Model, the quark composition of a proton is UUD (up quark, up quark, down quark).

What is the quark composition of a neutron?

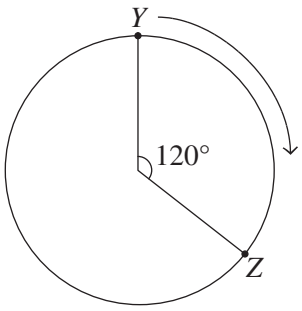
A. UUU

B. UUD

C. UDD

D. DDD

9 A child has a marble racetrack toy. The toy has a marble of mass 0.075 g that rolls around a circular frictionless track. The marble can complete three rotations around the track in a clockwise direction every two seconds. The diagram shows the frictionless track with two points *Y* and *Z* labelled.



How long does it take the marble to move from point *Y* to point *Z*?

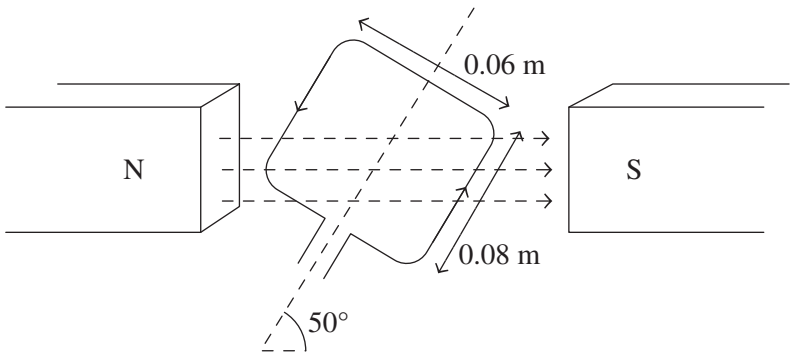
A. 0.11 seconds

B. 0.16 seconds

C. 0.20 seconds

D. 0.22 seconds

10 A coil contains 20 loops and is placed in a magnetic field with its plane at an angle of 50° to the magnetic field, as shown in the diagram.



The magnetic field is calculated to be 2.4 mT. An ammeter connected to the coil reads 0.6 mA.

What is the magnitude of the torque acting on the coil and the direction of the coil's rotation?

A. 8.89×70^{-8} Nm clockwise

B. 8.89×70^{-8} Nm anticlockwise

C. 1.96×70^{-7} Nm clockwise

D. 1.96×70^{-7} Nm anticlockwise

11 What is the energy in electron volts of a photon of light that has wavelength 535 nm?

A. 1.79 eV

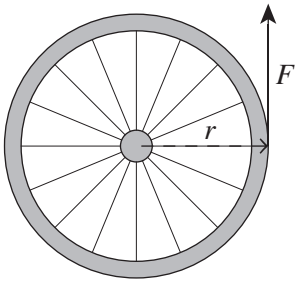
B. 2.00 eV

C. 2.11 eV

D. 2.32 eV

12 On which of the following bicycle wheels is the largest torque acting?

A.



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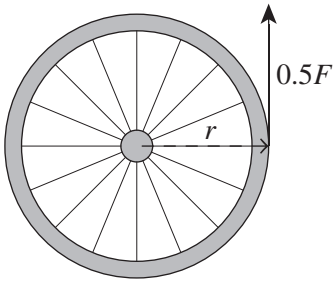

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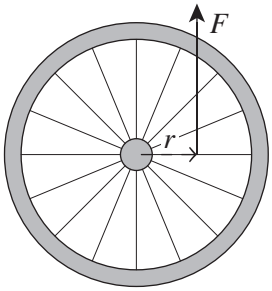
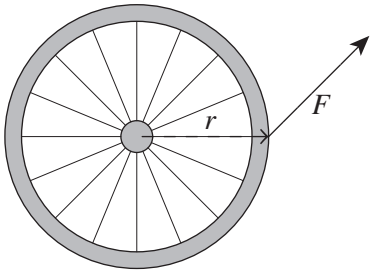


D.



13 De Broglie contributed to quantum theory by investigating matter waves.
At what velocity will an electron have a wavelength of 1 mm?

A. 7.3×10^{-4} m s^{-1}

B. 0.73 m s^{-1}

C. 3.0×10^{8} m s^{-1}

D. An electron is a particle and cannot have a wavelength.

14 Which of the following does NOT provide supporting evidence for Einstein's two postulates of special relativity?

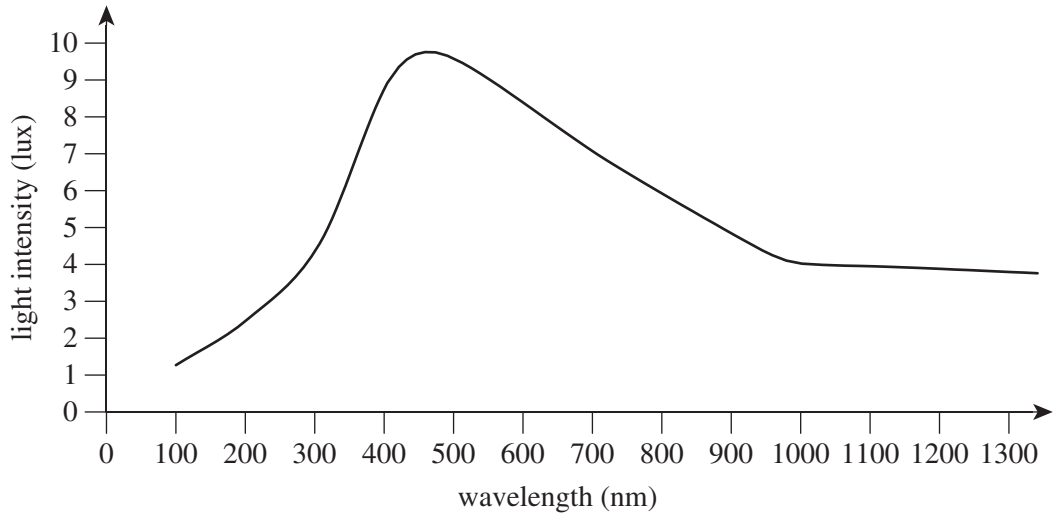
A. the Michelson–Morley experiment

B. the Hafele–Keating experiment

C. cosmological studies

D. the Geiger–Marsden experiment

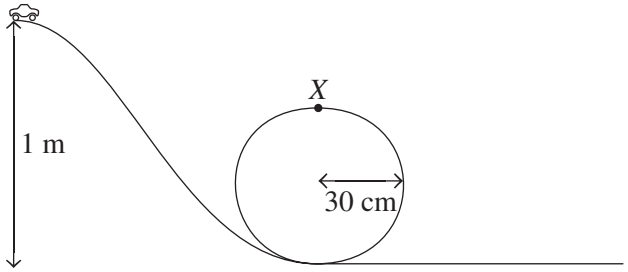
15 The black body radiation curve for a star is shown in the graph.



Which row of the table correctly shows the surface temperature and colour of the star?

	Temperature (°K)	*Colour*
A.	6440	blue
B.	7245	yellow
C.	6440	orange
D.	6000	orange

16 A Physics teacher is teaching a class about the effect of friction. They assemble a track that has a vertical loop of radius 30.0 cm. A toy car of mass 50.0 g is released from rest at a height of 1.00 m at the beginning of the track. The car rolls down the track and follows the loop before exiting the track. The teacher asks the class to calculate the speed of the toy car if the coefficient of friction were 0.



What is the calculated speed of the toy car as it reaches point *X*?

A. 1.49 m s^{-1}

B. 2.21 m s^{-1}

C. 2.80 m s^{-1}

D. 7.84 m s^{-1}

17 The planet Saturn has a mass of 5.70×10^{26} kg and a diameter of 139 820 km. A satellite in orbit around Saturn has a mass of 400 kg and is in orbit 1600 km above the surface of the planet.

What is the gravitational potential energy of the satellite?

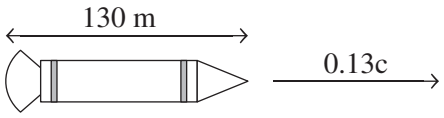
A. -1.98×10^{11} J

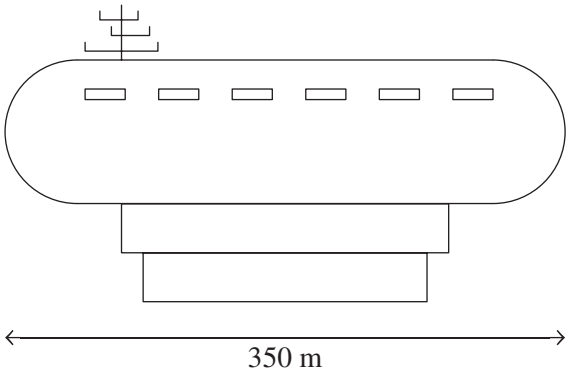
B. -2.07×10^{11} J

C. -2.13×10^{11} J

D. 2.13×10^{11} J

18 An astronaut is travelling aboard a spacecraft. The spacecraft has a length of 130 m and is flying at a speed of 0.13c. The spacecraft travels past a space station that has a length of 350 m, as shown in the diagram.





Which of the following correctly shows the length of the space station as perceived by the astronaut?

A. 347 m

B. 349 m

C. 350 m

D. 353 m

19 An alpha particle is travelling horizontally from right to left with a velocity of 0.60×10^{8} m s^{-1} in a uniform magnetic field. The field is perpendicular to the alpha particle's motion and has a strength of 0.80 T.

What is the radius of the alpha particle as it moves in the field?

A. 1.0 m

B. 1.3 m

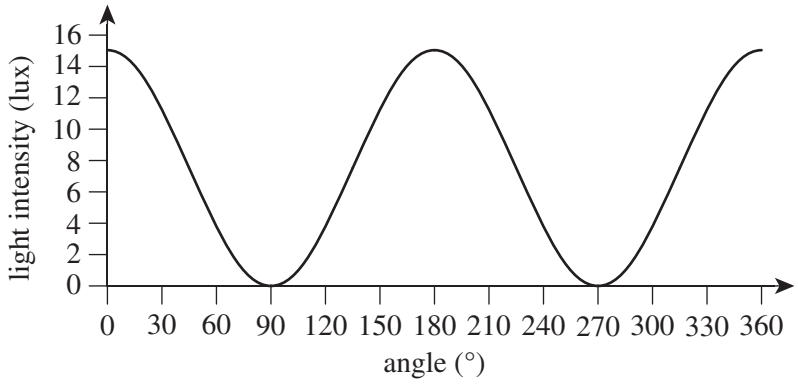
C. 1.6 m

D. 2.2 m

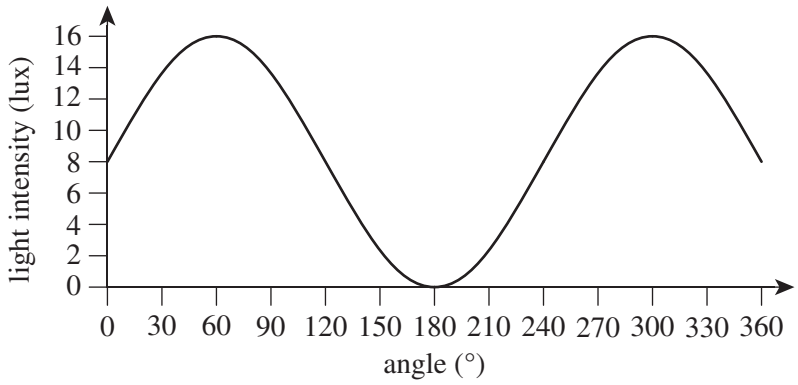
20 A student conducted an investigation to demonstrate Malus' Law. The student used two polarising filters and changed the filters' axes of polarisation to different angles. They recorded their results in a graph.

Which graph shows an expected result for the experiment?

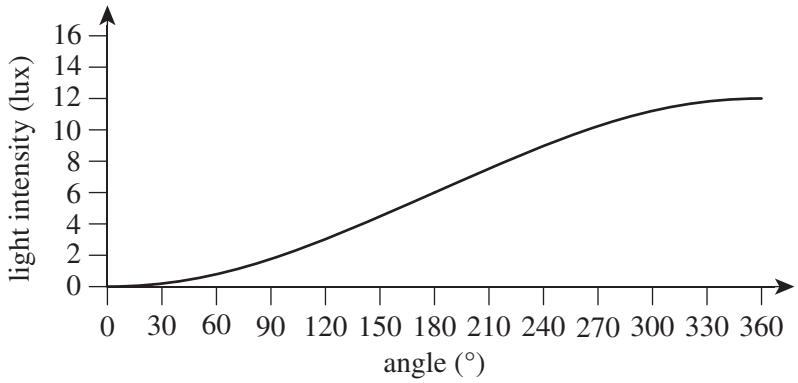
A.



B.



C.



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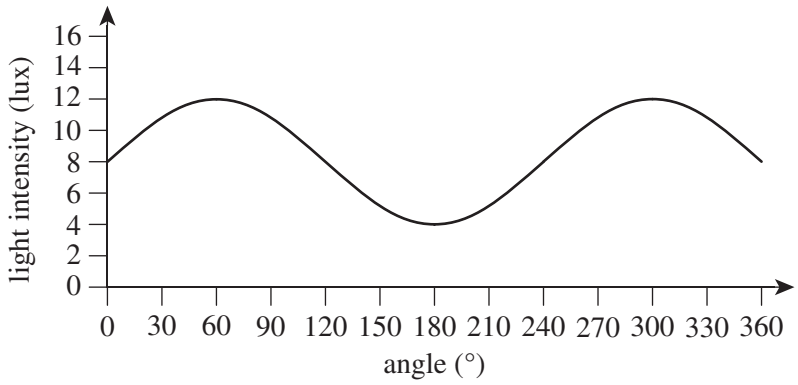


HSC Year 12 Physics

Section II Answer Booklet

Section II

80 marks

Attempt Questions 21–37

Allow about 2 hours and 25 minutes for this section

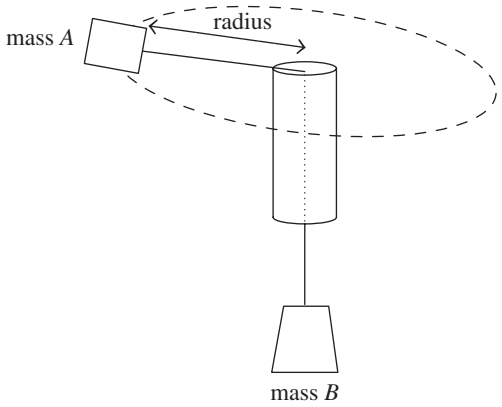
Instructions

- 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 (9 marks)

A student conducted several tests on circular motion. In the tests, mass *A* was swung on a circular path. Mass *B* provided the necessary force to balance mass *A*, resulting in a known radius as shown in the diagram.



The student varied the masses and radius for each test. They measured the time for mass *A* to make 10 rotations three times for each mass and radius, then averaged the three results to produce the table shown.

Test	*Mass of A (g)*	*Mass of B (g)*	*Radius of circle (m)*	*Time for 10 rotations (s)*
1	50	50	0.125	10
2	50	50	0.200	13
3	50	50	0.250	14
4	50	50	0.375	17
5	50	75	0.125	8
6	50	100	0.125	7
7	50	200	0.125	5
8	125	50	0.125	16
9	250	50	0.125	22
10	750	50	0.125	27

Question 21 continues on page 11

Question 21 (continued)

(a) Outline THREE different experiments conducted using the information from the table. **3**

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(b) For Tests 5, 6 and 7, identify the dependent, independent and TWO controlled variables. **3**

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(c) The student repeated all of the tests with 20 rotations. **1**

Would the experiment that used 10 rotations or the experiment that used 20 rotations be more reliable? Justify your answer.

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(d) Assuming there are no frictional forces, derive an equation for the radius of mass A in terms of v and g. Justify your answer. **2**

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End of Question 21

Question 22 (3 marks)

Determine the simplified ratio of the velocities of a low Earth orbit satellite travelling 300 km above the Earth's surface and a geostationary satellite travelling 35 700 km above the Earth's surface. **3**

Question 23 (5 marks)

Strontium-90 is a by-product of nuclear fission reactions. Strontium-90 undergoes radioactive beta decay into yttrium-90 with a half-life of 28.8 years.

(a) A sample of pure strontium-90 with an initial mass of 25 mg is used in a laboratory over many years. **2**

What is the mass of the sample after 10 years?

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(b) Write a balanced nuclear equation for the beta decay of Strontium-90. Part of the equation is shown below. **1**

$$\square^{90}\mathrm{Sr} \rightarrow \begin{matrix}\square \\ 39\end{matrix}\square + {}^{0}_{-1}e + \bar{\nu}$$

(c) Describe the concept of controlled nuclear fission in a nuclear reactor. In your answer, give ONE method of controlling nuclear fission. **2**

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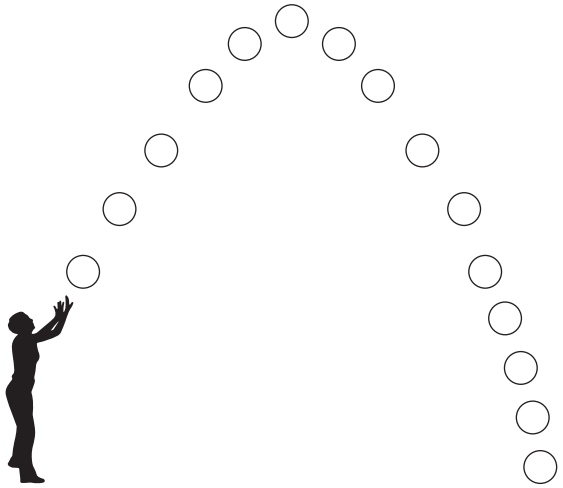
Question 24 (4 marks)

The diagram represents a time-lapse video of a person throwing a basketball into the air. A camera was used to record the video at five frames per second. The first frame was taken the moment the basketball left the person's hands.



(a) Assuming that the flight of the basketball was symmetrical, how long did it take the basketball to hit the ground after it was thrown and what was the maximum height it reached? **2**

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(b) Calculate the initial vertical velocity of the basketball. **2**

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Question 25 (7 marks)

(a) Describe the production and propagation of an electromagnetic wave. Use a diagram to support your answer. **3**

Question 25 continues on page 16

Question 25 (continued)

(b) State the FOUR observations predicted by Maxwell's electromagnetic theory. **4**

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End of Question 25

Question 26 (2 marks)

Outline how emission and absorption spectra are produced and whether the emission and absorption spectra of an element produce the same or different spectral lines. **2**

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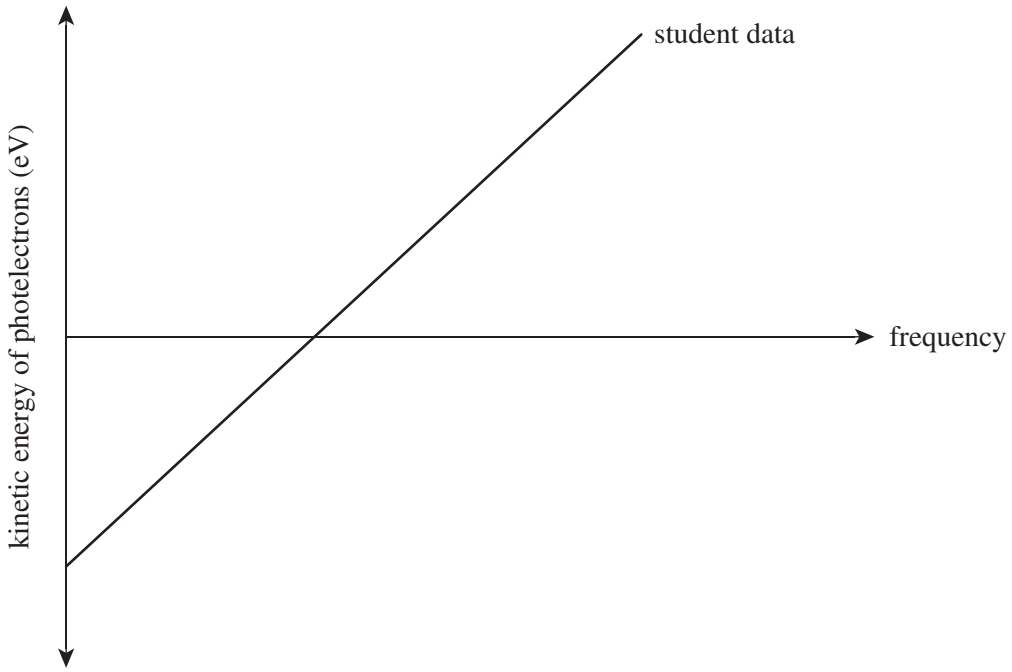
Question 27 (3 marks)

The graph shows a sample of students' results from a photoelectric effect experiment. **3**



On the graph, label the threshold frequency and work function, and explain how the results can be used to find a value for Planck's constant.

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Question 28 (8 marks)
A diffraction grating has 1250 lines per mm.

(a) What is the spacing of the slit in the grating? **1**

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(b) A student shone monochromatic light at the diffraction grating and found a first-order maximum at an angle of 16° to the central maximum. **2**

Find the wavelength of the light source.

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(c) Find the angle of the second-order maximum when light of wavelength 375 nm is shone at the grating. **2**

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Question 28 continues on page 19

Question 28 (continued)

(d) In another experiment, laser light of wavelength 630 nm was shone at a double slit with a slit separation of 50.0 μm. The double slit was placed a fixed distance from a screen and the bright fringes of the interference pattern were 3.10 cm apart. **3**

Calculate the distance of the double slit to the screen. Give your answer to three significant figures.

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End of Question 28

Question 29 (3 marks)

A student placed polarised lens *A* over polarised lens *B*, as shown in Figure 1. **3**

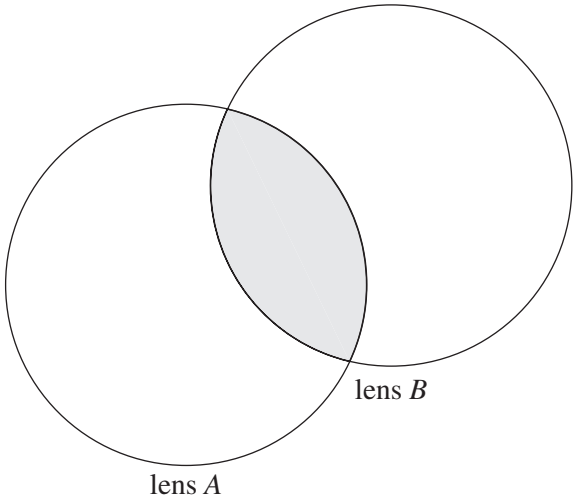

Figure 1

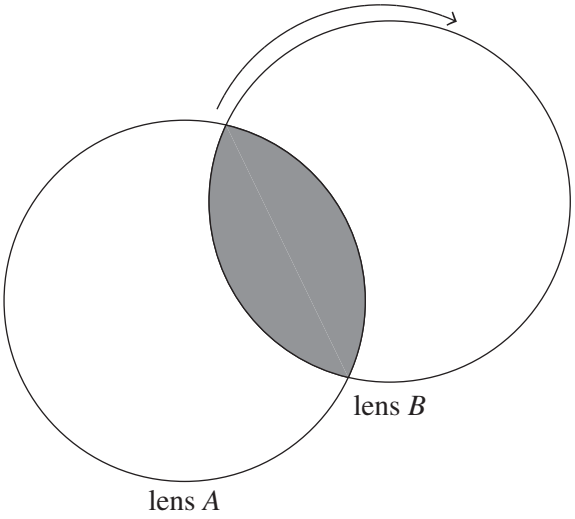

Figure 2

The student then rotated lens *B*, as shown in Figure 2.

Explain what is meant by polarisation and explain how it relates to Figure 1 and Figure 2.

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Question 30 (7 marks)

(a) Explain the relationship between the age and temperature of the Universe. **2**

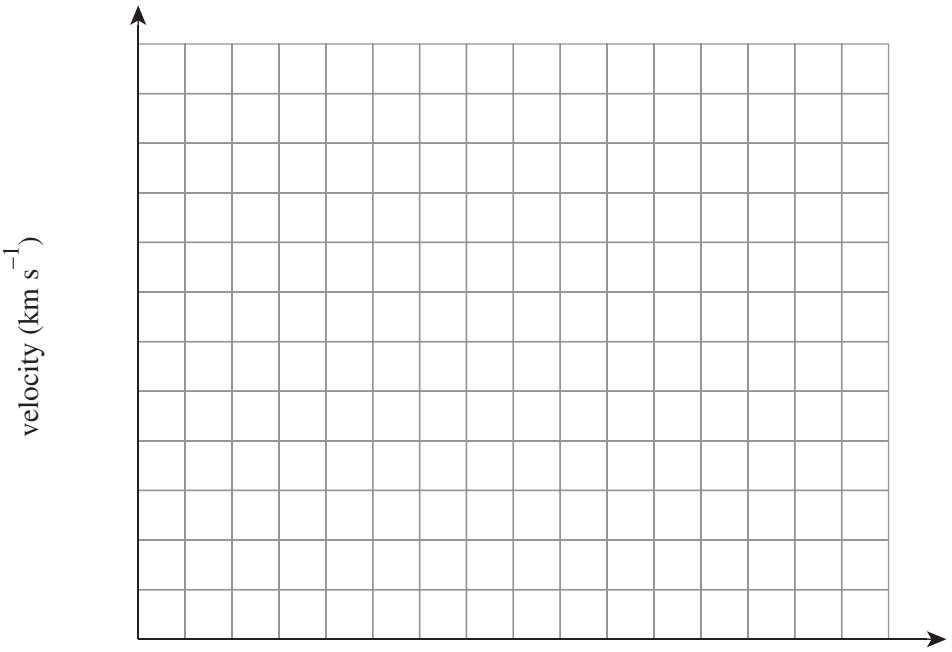
(b) Discuss how particle accelerators have increased our understanding of the early Universe following the Big Bang. **5**

Question 31 (6 marks)

The data shown in the table was shared by the Hubble Space Telescope.

Galaxy	*Distance from Earth (Mpc)*	*Recessional velocity (km s^{-1})*
Alpha	11	850
Beta	14	1050
Omega	32	1900
Lambda	51	3150
Delta	62	4000
Zeta	98	

(a) Graph the data from the table on the axes below. Include a line of best fit. **2**



(b) Using the graph from part (a), predict the recessional velocity for galaxy Zeta. **1**

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Question 31 continues on page 23

Question 31 (continued)

(c) The data in the table on page 22 shows evidence for the expansion of the Universe and gives support to the idea that the Universe began from a hot Big Bang. **3**

Describe the processes that transformed radiation and energy into matter following the Big Bang.

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End of Question 31

Question 32 (3 marks)

The carbon-oxygen-nitrogen (CNO) cycle occurs in stars that are at least 1.3 times heavier than the Sun. The first step in the cycle can be represented by the nuclear fusion equation.

$$C_6^{12} + H_1^1 \rightarrow N_7^{13} + \gamma_0^0$$

The exact masses of these isotopes are shown in the table.

Isotope	*Exact mass*
^{12}C	12.000
^{1}H	1.0078
^{13}N	13.0057

(a) Using the equation, calculate the mass defect of the first step of the CNO cycle in megaelectron volts. **2**

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(b) Using the equation, calculate the energy released during of the first step of the CNO cycle in joules. **1**

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Question 33 (3 marks)

Rutherford's model of the atom was an improvement on earlier models. Despite this, it could not explain some observations. **3**

Describe ONE limitation of Rutherford's atomic model and assess the model's contribution to the development of the nuclear model.

Question 34 (4 marks)

(a) A charged particle, particle *X*, is moving perpendicular to an electric field. Another charged particle, particle *Y*, is moving perpendicular to a magnetic field. **2**

Assuming that particles *X* and *Y* have the same initial velocity, outline ONE similarity and ONE difference between the behaviours of the particles in the fields.

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(b) Compare the trajectory of a charged particle in either an electric OR a magnetic field to the trajectory of a projectile in a gravitational field. **2**

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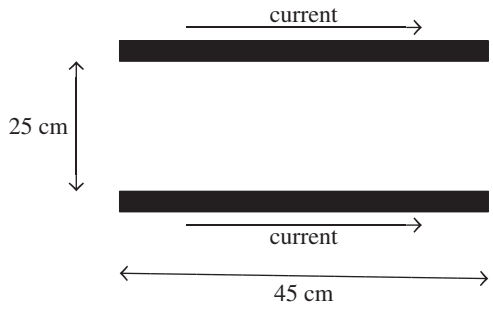
Question 35 (6 marks)

The diagram shows two current-carrying conductors placed parallel to each other. The conductors are both 45 cm in length.



The conductors are made of aluminium foil wire and each have a resistance of 0.40 Ω. A voltage of 2 V is passed through each wire.

(a) Calculate the force per unit length between the wires. **3**

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(b) With reference to the motor effect, explain whether the wires are attracting or repelling each other. Use a diagram to support your answer. **3**

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Question 36 (4 marks)

(a) A current of 3.0×10^{-2} A was input into a transformer in which the secondary winding had 20 times the number of primary turns. **2**

Calculate the output current if there were no power loss.

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(b) Outline the role of transformers in household electrical goods. **2**

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Question 37 (3 marks)

A rectangular coil with dimensions 0.02 m by 0.03 m is placed between the poles of two bar magnets that generate a field strength of 0.075 T. The coil has 200 turns and is initially in a plane parallel to the field lines. **3**

If the coil is made to rotate anticlockwise to reach a vertical position in a plane perpendicular to the field lines in 0.010 s, calculate the emf generated in the coil.

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

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

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

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

$$W = qV$$

$$W = qEd$$

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

$$B = \frac{\mu_0 NI}{L}$$

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

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

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

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

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

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

$$V = IR$$

$$P = VI$$

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

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

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

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

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

Quantum, special relativity and nuclear

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

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

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

$$E = mc^2$$

$$E = hf$$

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

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

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

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

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

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

PERIODIC TABLE OF THE ELEMENTS

KEY

atomic number
symbol
standard atomic weight
name

79 Au 197.0 gold

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.

Trial Examination 2021

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