Neap:

Trial Examination 2010

VCE Physics Unit 3

Written Examination

Question and Answer Booklet

Reading time: 15 minutes
Writing time: 1 hour 30 minutes

Student's Name: ______________________________

Teacher's Name: ______________________________

Structure of Booklet

Section	Number of questions	Number of questions to be answered	Number of marks
A Core – Areas of study			
1. Motion in one and two dimensions	14	14	40
2. Electronics and photonics	12	12	24
B Detailed studies			
1. Einstein's special relativity **OR**	13	13	26
2. Materials and their use in structures **OR**	13	13	26
3. Further electronics	13	13	26
			Total 90

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, up to two pages (one A4 sheet) of pre-written notes (typed or handwritten) and one scientific calculator.
Students are NOT permitted to bring into the examination room: blank pieces of paper and/or white out liquid/tape.

Materials supplied

Question and answer booklet of 37 pages with a detachable data sheet in the centrefold.

Answer sheet for multiple-choice questions.

Instructions

Detach the data sheet from the centre of this booklet during reading time.

Please ensure that you write your **name** and your **teacher's name** in the space provided on this booklet and on the answer sheet for multiple-choice questions.

Always show your working where space is provided.

Where an answer box has a unit printed in it, give your answer in that unit.

All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2010 VCE Physics Unit 3 Written Examination.

SECTION A – CORE

Instructions for Section A

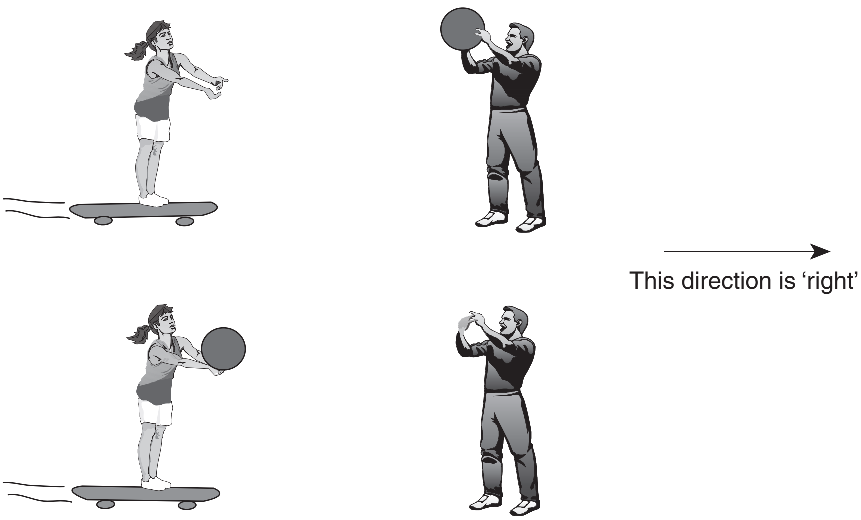
Answer **all** questions **for both** Areas of study in this section of the paper.
Where an answer box has a unit printed in it, give your answer in that unit.
You should take the value of g to be 10 m s^{-2}.
In questions where more than one mark is available, appropriate working should be shown.

Areas of study **Page**

Area of study 1 – Motion in one and two dimensions

The following information relates to Questions 1 and 2.

Selena is skateboarding towards John, who is stationary and holding a medicine ball. As Selena moves towards John at 2.00 m s^{-1}, John hurls the medicine ball at Selena and she catches it.



The ball is travelling at 1.00 m s^{-1} horizontally when it is caught by Selena moving on her skateboard. Friction between the skateboard and the ground is negligible. Selena and the skateboard have a total mass of 60 kg and the medicine ball has a mass of 12.0 kg. The direction labelled 'right' is shown.

Question 1

Calculate the velocity (magnitude and direction) of the Selena–skateboard–medicine ball system immediately after the ball is caught.

Include in your answer the direction, and circle one of the 'left' or 'right' or 'neither' options in the box below.

m/s

Direction:	left	right	neither

4 marks

After the event, Selena and John discuss the situation. Selena states that the total momentum of herself, the skateboard and the ball system is conserved because the collision is elastic.

John states that the total momentum of the system mentioned by Selena is not conserved because the collision is inelastic.

The total kinetic energy of the Selena-skateboard-medicine ball system **before** she catches the medicine ball is 126 J. The total kinetic energy of the Selena–skateboard–medicine ball system **after** the collision is less than 100 J.

Question 2

State whether or not John and Selena's statements are correct. Provide an explanation to justify your statements about Selena and John.

3 marks

The following information relates to Questions 3 to 5.

One of the rides at a carnival is the Chair-O-Plane, as seen in Figure 1. It consists of safety belt seats connected by a chain to a rotating ceiling. The rotating ceiling is attached to a central column. In **the middle of the ride time**, the chairs reach **a constant speed and travel in a horizontal circle**. Each seat has 2 chain cables which connect to a single rigging. The rigging connects to the rotating ceiling through a single cable.

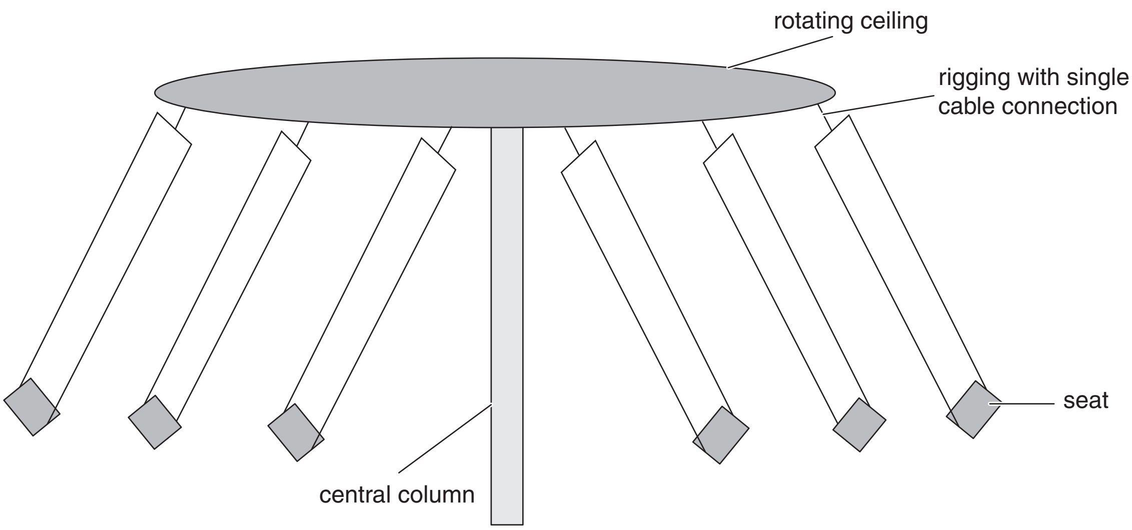
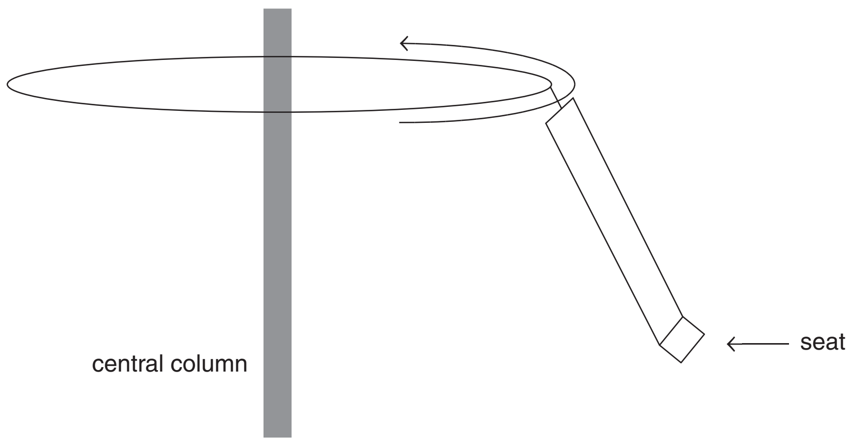


Figure 1

Question 3

On the diagram below, mark in the net force acting on the seat as it rotates horizontally in **the middle of the ride time**. The direction of rotation of the rotating ceiling is shown.



1 mark

In the middle of the ride,
- the rotating chair completes a (horizontal) revolution in 5.11 seconds,
- the centre of the chair is a horizontal distance of 10.2 m from the centre of the central column,
- the cabling of the chair forms an angle of 57 degrees to the vertical plane.

Samantha, whose mass is 60.0 kg, is taking a ride. The situation is shown in Figure 2.

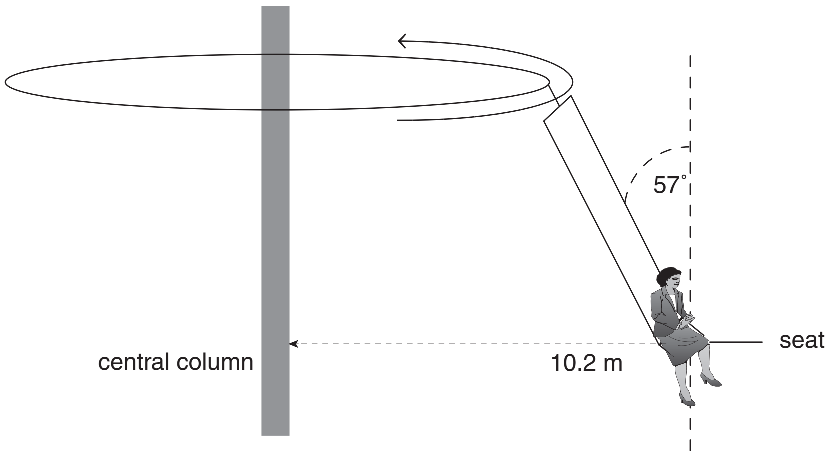


Figure 2

Question 4

What is the size of the net force acting on Samantha whilst in the middle of the ride time? Express your answer to three significant figures.

N

2 marks

Question 5

What is the size of the tension force in the single cable in the middle of the ride?

N

2 marks

The following information relates to Questions 6 and 7.

Fred mows the lawn using a lawn mower as shown in Figure 3. The forces acting on the mower are also shown.

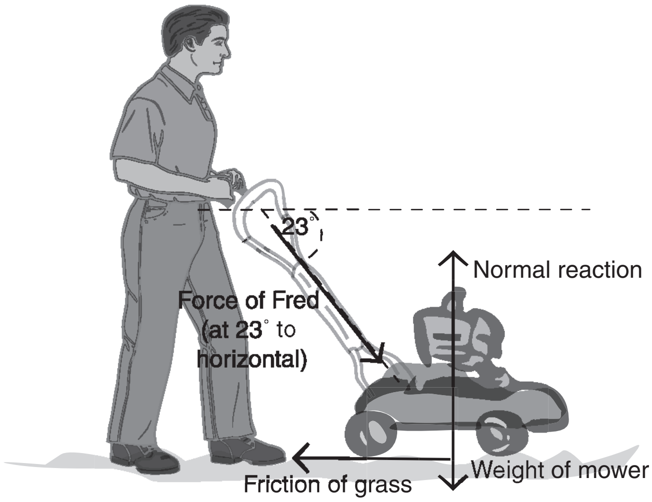


Figure 3

The mower takes 4.59 seconds to accelerate 10.0 m (to the right) from the rest.

The force of Fred pushing the mower is 140 N at 23° to the horizontal.

The mass of the mower is 30.0 kg.

Question 6

Determine the work done by the net force acting on the mower. Express your answer to **three significant figures.**

J

3 marks

Question 7

Calculate the apparent weight of the mower.

N

3 marks

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The following information relates to Questions 8 and 9.

A boy has a slingshot and fires a stone **vertically** into the air, as shown in Figure 4.

Figure 4

The force–extension curve for the slingshot is shown in Figure 5.

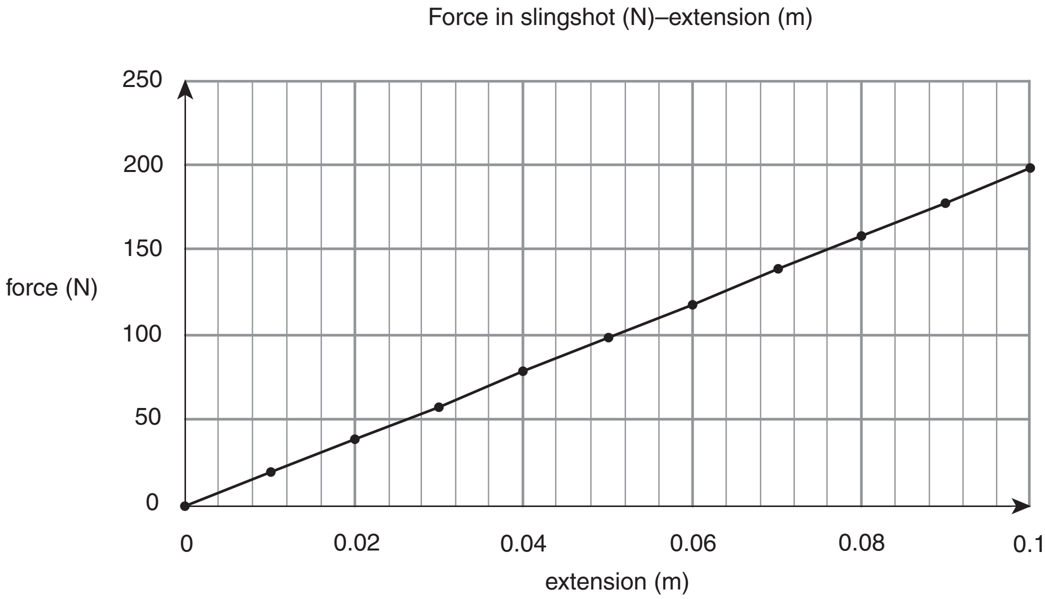


Figure 5

Question 8

Determine the energy stored in the slingshot system if it is stretched by 15 cm.

J

2 marks

The stone has a mass of 20 grams.

Question 9

What is the maximum height from the point of release that the stone is expected to rise to?

m

3 marks

The following information relates to Questions 10 to 12.

A cricket batsman hits a cricket ball off the ground and the ball propels through the air and first bounces on the ground 54 m after being struck. The ball reaches a maximum height of 18 m. Position *A* is a point on the path of the ball as shown in Figure 6.

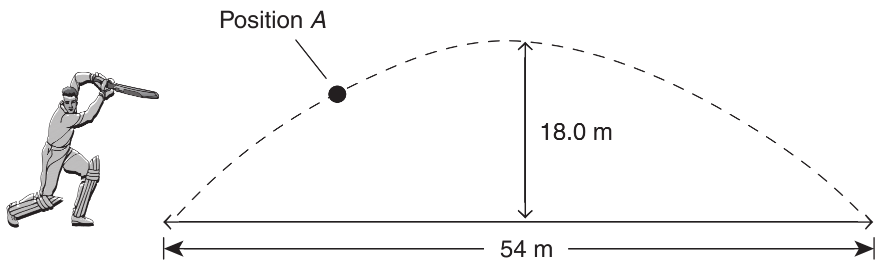


Figure 6

Question 10

Ignoring the effects of air resistance, how long does the ball spend in the air?

s

3 marks

Question 11

Ignoring the effects of air resistance, determine the angle, θ, the ball propels initially from the bat as it is struck from the ground. The angle is shown in Figure 7.

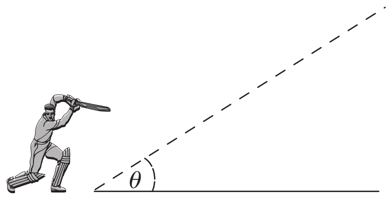


Figure 7

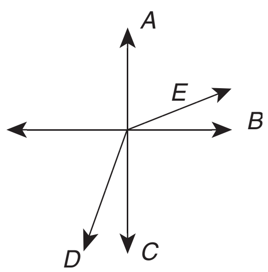
°	

4 marks

Air resistance is now not able to be ignored.

Question 12

Which of the arrows *A*–*F* represents the net acceleration acting on the ball at position *A* in Figure 6?



2 marks

A rollercoaster is going over a part of its track which is in a vertical plane as shown. At the highest point, the rollercoaster travels freely without the use of its motor. At the highest point the speed of the rollercoaster is 12 m s^{-1}. Both occupants each have a mass of 60.0 kg. The diameter of the track as it forms part of a circle is 28.8 m as shown in Figure 8.

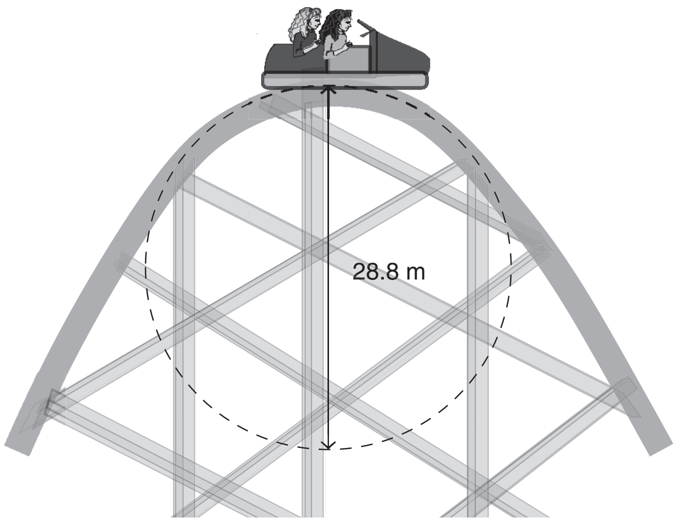


Figure 8

Question 13

Do the occupants of the rollercoaster feel weightless when the rollercoaster is travelling at the top of the track as shown above? Provide a calculation to justify your answer and an explanation that links the calculation to the concept of weightlessness.

YES	or	NO

4 marks

The NOAA (National Oceanographic and Atmospheric Administration) satellites are used to monitor the world's weather and to relay information about surface and atmospheric conditions on earth. These satellites orbit the Earth with a period of 102 minutes.

Question 14

Determine the altitude (above Earth), in kilometres, of a NOAA satellite.

km

4 marks

END OF AREA OF STUDY 1

Area of study 2 – Electronics and photonics

The following information relates to Questions 1 to 3.

Two resistors are connected to a 6.0 V battery as shown in Figure 1.

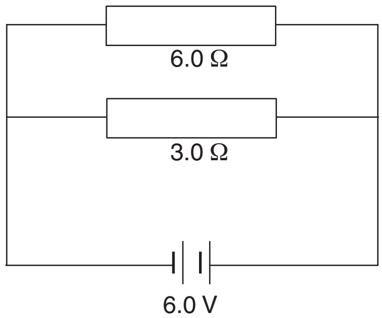


Figure 1

Question 1

Calculate the total effective resistance of the two resistors. Show your working.

Ω

2 marks

Question 2

Calculate the current through the 3.0 Ω resistor. Show your working.

A

2 marks

Question 3

Calculate the power dissipated in the 6.0 Ω resistor. Show your working.

W

2 marks

The following information relates to Questions 4 to 6.

The diagram below (Figure 2) shows an optoelectronic device placed in an electrical circuit.

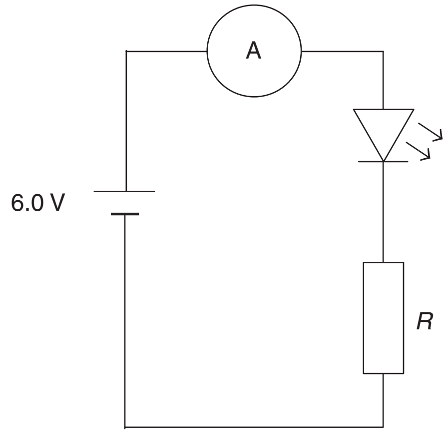


Figure 2

Question 4

On Figure 2 draw a circle around the optoelectronic device in the electrical circuit and identify the component.

2 marks

The characteristic graph for the optoelectronic device (shown in Figure 2) is shown in Figure 3 below.

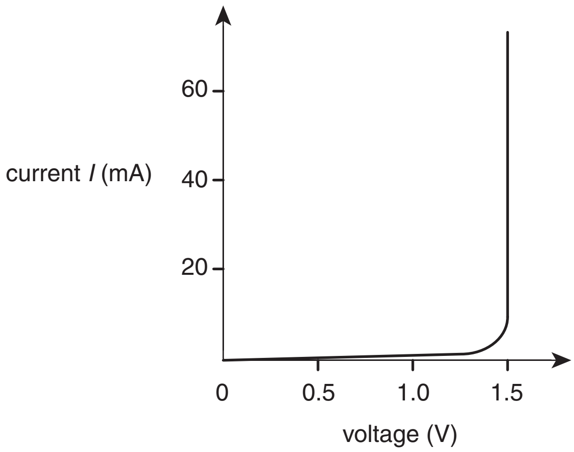


Figure 3

Question 5

Calculate the current through the optoelectronic device if the value of R is 450 Ω. Show your working.

mA

2 marks

Question 6

The optoelectronic device shown in Figure 2 is now reversed in the circuit. What is the magnitude of the voltage drop across the optoelectronic device in this situation? Provide an explanation for your answer.

V

3 marks

The following information relates to Questions 7 to 9.

The diagram below (Figure 4) shows the characteristic resistance–temperature graph for a thermistor used in an air-conditioning unit in the family room of a house.

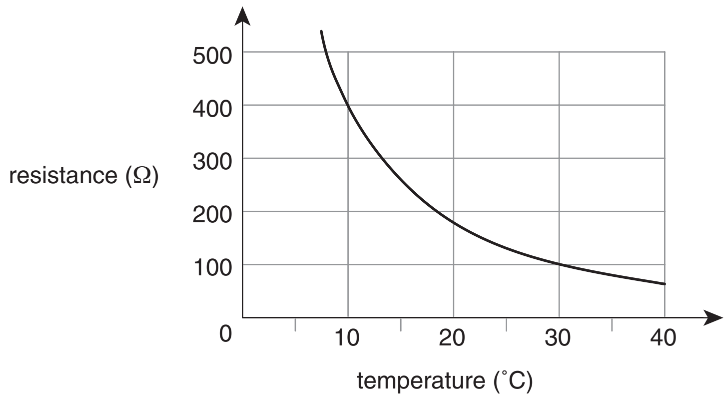


Figure 4

Question 7

Kanti comes home and finds that the family room is 30°C.
What is the value of the resistance of the thermistor when the temperature in the room is 30°C?

Ω

1 mark

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The control circuit for the air-conditioning unit is shown in Figure 5 below. R_1 is set by the manufacturer at 200 Ω.

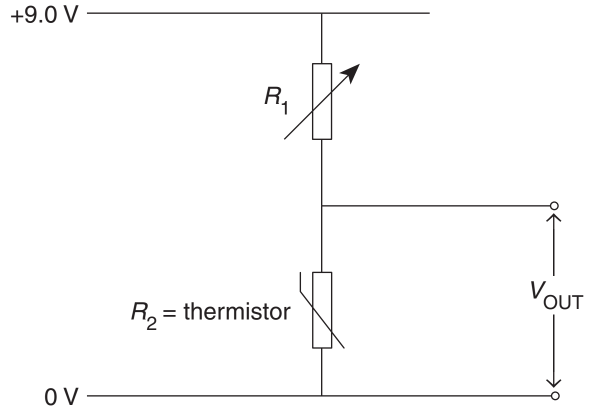


Figure 5

Question 8

Calculate the value of V_{OUT} when the temperature in the room is 30 °C. Show your working.

V

2 marks

Kanti wants to cool the room from 30 °C so she turns the air-conditioning on and sets it for 18 °C. When the room reaches 18 °C the air-conditioner automatically turns off.

Question 9

Calculate the value of V_{OUT} when the temperature in the room is 18°C and the air-conditioner automatically turns off. Show your working.

V

2 marks

The following information relates to Questions 10 and 11.

Figure 6 shows the output voltage versus input voltage for an amplifier.

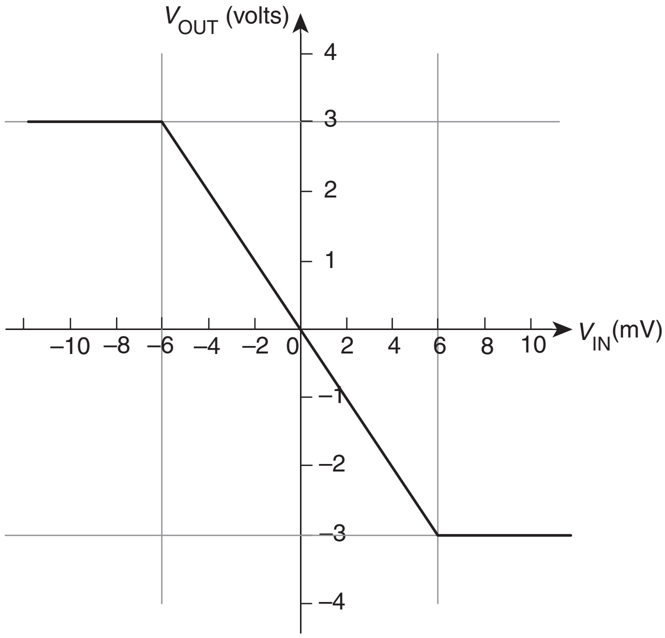


Figure 6

Question 10

Calculate the gain of the amplifier. Show your working.

2 marks

A sinusoidal input voltage as shown in Figure 7 is applied to the amplifier.

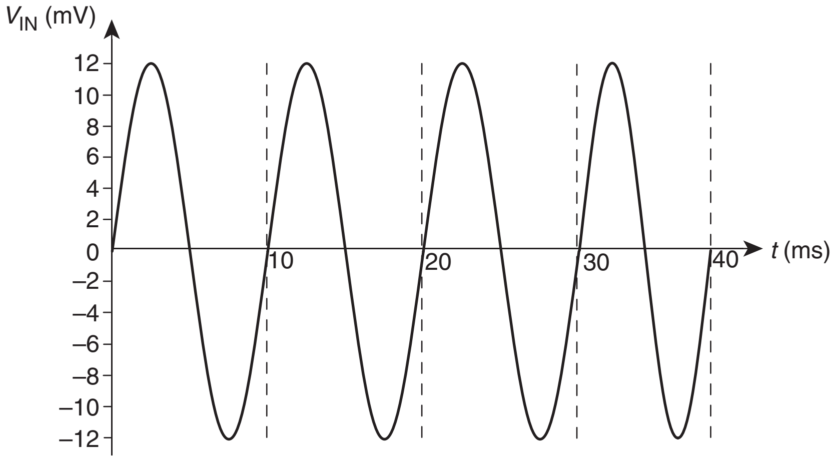
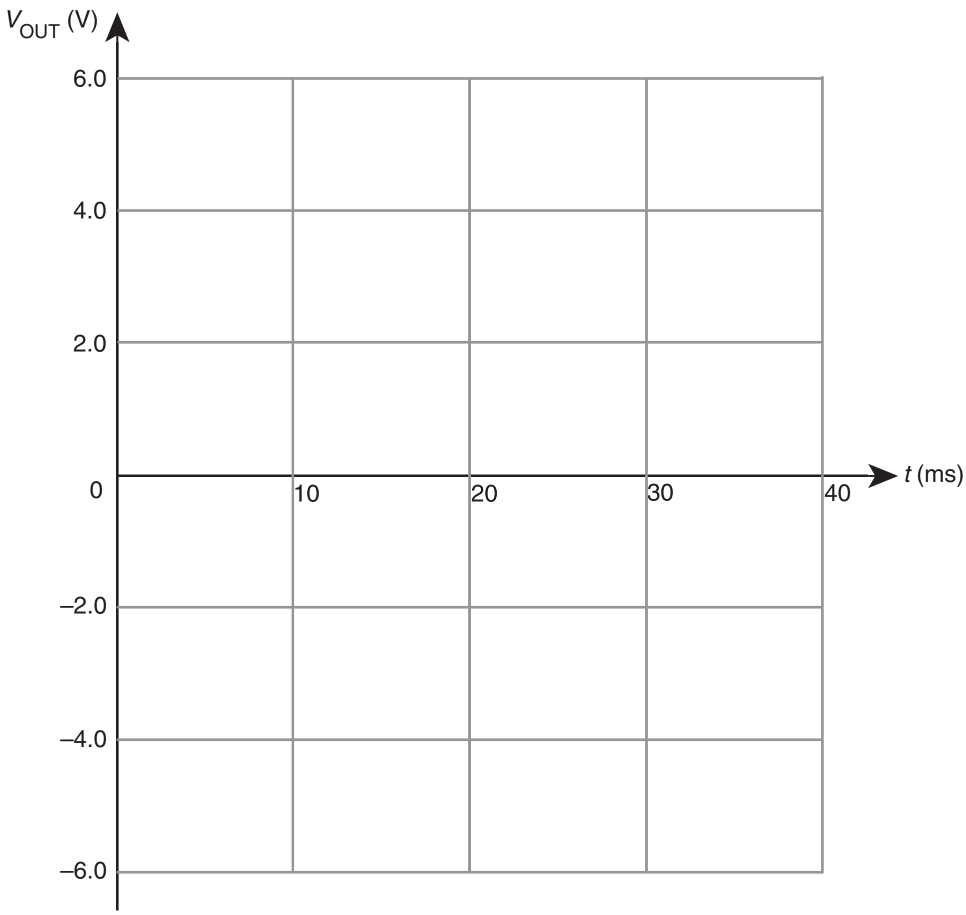


Figure 7

Question 11

On the axes below draw the output voltage V_{OUT} of the amplifier.



3 marks

Figure 8 shows an optical intensity modulated communication system.

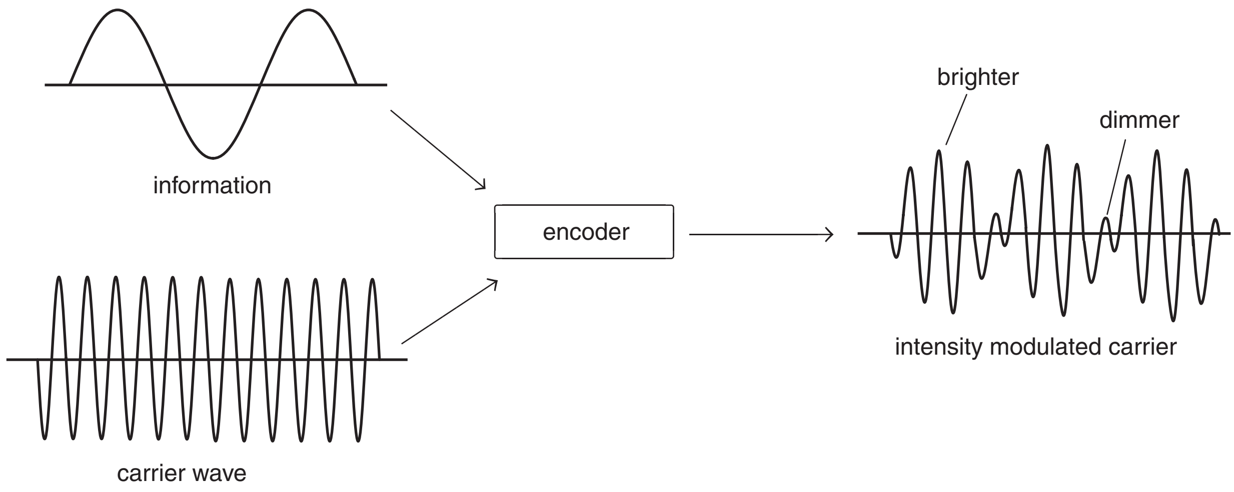


Figure 8

Question 12

Information can be transmitted using an optical intensity modulated communication system. The system shown in Figure 8 is an analogue system.

Explain what is meant by the term ‘analogue system’.

___

___

___

1 mark

END OF AREA OF STUDY 2

Neap:

Trial Examination 2010

VCE Physics Unit 3

Written Examination

Data Sheet

Detach this data sheet before commencing the examination.
This data sheet is provided for your reference.

Physics Unit 3 Data Sheet

1	velocity; acceleration	$v = \frac{\Delta x}{\Delta t}$; $a = \frac{\Delta v}{\Delta t}$
2	equations for constant acceleration	$v = u + at$ $x = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2ax$ $x = \frac{1}{2}(v + u)t$
3	Newton's second law	$F = ma$
4	circular motion	$a = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$
5	Hooke's law	$F = -kx$
6	elastic potential energy	$\frac{1}{2}kx^2$
7	gravitational potential energy near the surface of the Earth	mgh
8	kinetic energy	$\frac{1}{2}mv^2$
9	Newton's law of universal gravitation	$F = G\frac{M_1 M_2}{r^2}$
10	gravitational field	$g = G\frac{M}{r^2}$
11	stress	$\sigma = \frac{F}{A}$
12	strain	$\varepsilon = \frac{\Delta L}{L}$

13	Young's modulus	$E = \dfrac{\text{stress}}{\text{strain}}$
14	transformer action	$\dfrac{V_1}{V_2} = \dfrac{N_1}{N_2}$
15	AC voltage and current	$V_{\text{RMS}} = \dfrac{1}{2\sqrt{2}} V_{\text{p–p}};\ I_{\text{RMS}} = \dfrac{1}{2\sqrt{2}} I_{\text{p–p}}$
16	voltage; power	$V = RI;\ P = VI = I^2R$
17	resistors in series	$R_T = R_1 + R_2$
18	resistors in parallel	$\dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$
19	capacitors	time constant: $\tau = RC$
20	Lorentz factor	$\gamma = \dfrac{1}{\sqrt{1 - \dfrac{v^2}{c^2}}}$
21	time dilation	$t = t_0\gamma$
22	length contraction	$L = \dfrac{L_0}{\gamma}$
23	relativistic mass	$m = m_0\gamma$
24	Total energy	$E_{total} = E_k + E_{rest} = mc^2$
25	universal gravitational constant	$G = 6.67 \times 10^{-11}$ N m^2 kg^{-2}

26	mass of Earth	$M_E = 5.98 \times 10^{24}$ kg
27	radius of Earth	$R_E = 6.37 \times 10^{6}$ m
28	mass of the electron	$m_e = 9.1 \times 10^{-31}$ kg
29	charge on the electron	$e = -1.6 \times 10^{-19}$ C
30	speed of light	$c = 3.0 \times 10^{8}$ m s^{-1}

Prefixes/Units

p = pico = 10^{-12}

n = nano = 10^{-9}

μ = micro = 10^{-6}

m = milli = 10^{-3}

k = kilo = 10^{3}

M = mega = 10^{6}

G = giga = 10^{9}

t = tonne = 10^{3} kg

END OF DATA SHEET

SECTION B – DETAILED STUDIES

Instructions for Section B

Choose **one** of the following **Detailed studies**.

Answer **all** the questions on the Detailed study you have chosen.

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 2, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

You should take the value of g to be 10 m s^{-2}.

Detailed study **Page**

Detailed study 1 – Einstein's special relativity

The following information relates to Questions 1 and 2.

An observer at *O* sees a square moving past her to the right at a speed of 0.9 *c*, as shown in Figure 1.

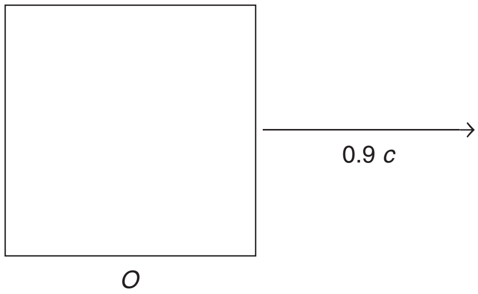
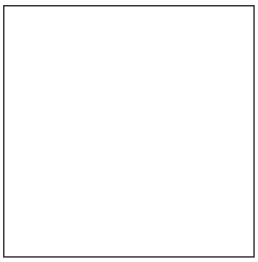
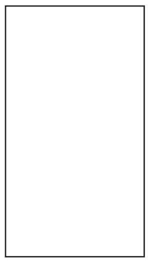


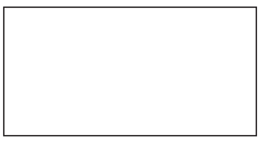
Figure 1

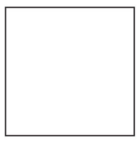
Question 1

Which of the following best represents how the square would look from her reference frame?

A. 

B. 

C. 

D. 

Question 2

The Lorentz factor, γ, for the situation shown in Figure 1 is closest to

A. 0
B. 1.0
C. 2.3
D. 3.2

The following information relates to Questions 3 and 4.

Einstein's special theory of relativity published in 1905 put forward two postulates concerning inertial reference frames and the speed of light.

Question 3

Postulate one was:

A. The speed of light depends on the observer.
B. No law of physics can identify a state of absolute rest.
C. Time and space are absolute.
D. Gravity is constant everywhere.

Question 4

Postulate two was:

A. The speed of light is independent of the motion of the light source or observer.

B. Physics laws can identify a state of absolute rest.

C. Mass can be converted to energy.

D. Gravity changes depending on the speed of the observer.

The following information relates to Questions 5 and 6.

The Michelson–Morley Experiment of 1887 is considered a very important experiment in physics. It used an interferometer to study the interference pattern created by various path lengths of light.

Question 5

The purpose of the Michelson–Morley experiment was to determine

A. the speed of light.

B. the existence of the aether.

C. that Einstein's relativity theory was correct.

D. the existence of time dilation.

Michelson and Morley saw no shift in the interference pattern at the interferometer.

Question 6

The results of the Michelson–Morley Experiment demonstrated

A. the aether does not exist.

B. the speed of light is 3.0×10^{8} ms^{-1}.

C. the wave model for light is correct.

D. time dilation.

An electron is accelerated up to a speed of 0.999999 c in a linear accelerator.
The rest mass of an electron is 9.1×10^{-31} kg.

Question 7

The Lorentz factor for this electron is

A. 0.707

B. 7.07

C. 70.7

D. 707

The space shuttle travels at 28 000 km h^{-1} in its orbit around the earth.

Question 8

Which one of the following statements best explains why measuring time using Newtonian physics is a very good approximation to using Einstein's physics for the space shuttle travelling at 28 000 km h^{-1} in its orbit around the earth?

A. $\gamma \approx 0$

B. $\gamma \approx 0.5$

C. $\gamma \approx 0.95$

D. $\gamma \approx 1$

A proton is accelerated to a speed of 0.95 c in a linear accelerator, which increases both the proton's speed and its energy.

Question 9

Which of the following best describes the effect of the linear accelerator on the proton's speed and its energy?

A. Both the speed and the energy increase slightly.
B. The speed increases substantially whilst the energy increases slightly.
C. The speed increases slightly whilst the energy increases substantially.
D. Both the speed and the energy increase substantially.

The following information relates to Questions 10 and 11.

The proton has a Lorentz factor of 4 as it travels in a straight line a distance of 1200 m as measured in the accelerator's frame of reference.

Question 10

Which of the following best gives the speed of the proton?

A. 0.25 c
B. 0.94 c
C. 0.97 c
D. 0.99 c

Question 11

Which of the following gives the best approximation of the length of the linear section of the accelerator as measured in the proton's frame of reference?

A. 300 m
B. 600 m
C. 2400 m
D. 4800 m

Cars use the Global Positioning System (GPS) to locate their position on the road network. An extremely accurate clock is on board each orbiting satellite and it continually broadcasts the time to GPS receivers on Earth. Over a period of exactly 60 minutes the total time difference between the clock in the orbiting satellite and the clock in the GPS receiver is measured as 1.583×10^{-6} s.

Question 12

Assuming this time difference is due only to the effects of special relativity, which of the following statements is correct?

A. The GPS receiver measures the satellite clock as running more slowly than itself.
B. The GPS receiver measures the satellite clock as running at the same rate as itself.
C. The GPS receiver measures the satellite clock as running faster than itself.
D. The orbiting satellite is travelling near the speed of light.

Vela is captain of a starship travelling at 0.85 *c* as it explores the universe. Her mass is 60 kg as determined when she is on the Earth.

Question 13

Which one of the following would be the closest to her mass when she is travelling at 0.85 *c*?

A. 60 kg
B. 93 kg
C. 114 kg
D. 120 kg

END OF DETAILED STUDY 1

Detailed study 2 – Materials and their use in structures

The following information relates to Questions 1 and 2.

Figure 1 shows the stress–strain curves for mild steel and cast iron.

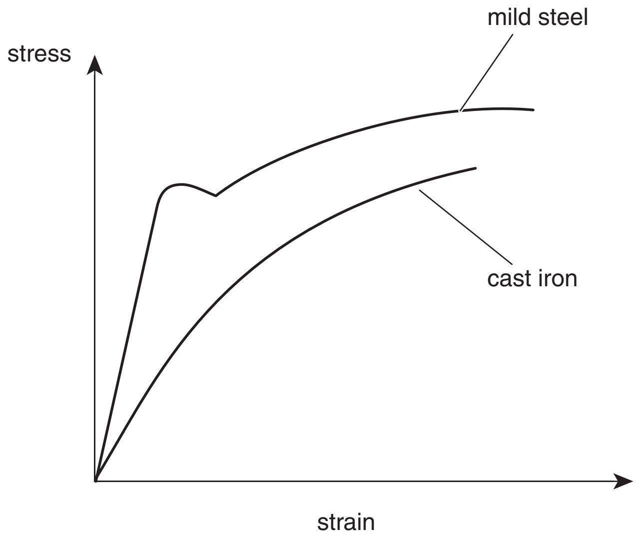


Figure 1

Question 1

Which **one or more** of the statements below applies to the cast iron **compared to** the mild steel?

A. It requires a greater force per same cross-sectional area in order to break it into two pieces.

B. It is less stiff.

C. It has a greater braking strain.

D. It is more ductile.

Question 2

Which one of the following statements about toughness is correct?

A. The cast iron is tougher than the mild steel.

B. The mild steel absorbs more energy than the cast iron.

C. The mild steel absorbs more energy per unit volume than the cast iron.

D. The cast iron is not as tough as the mild steel since it fractures at a lower stress.

The following information relates to Questions 3 to 7.

Figure 2 below shows the stress–strain curve for a particular metal.

The ultimate tensile stress, elastic limit, strain at the elastic limit and strain at the ultimate tensile stress are shown.

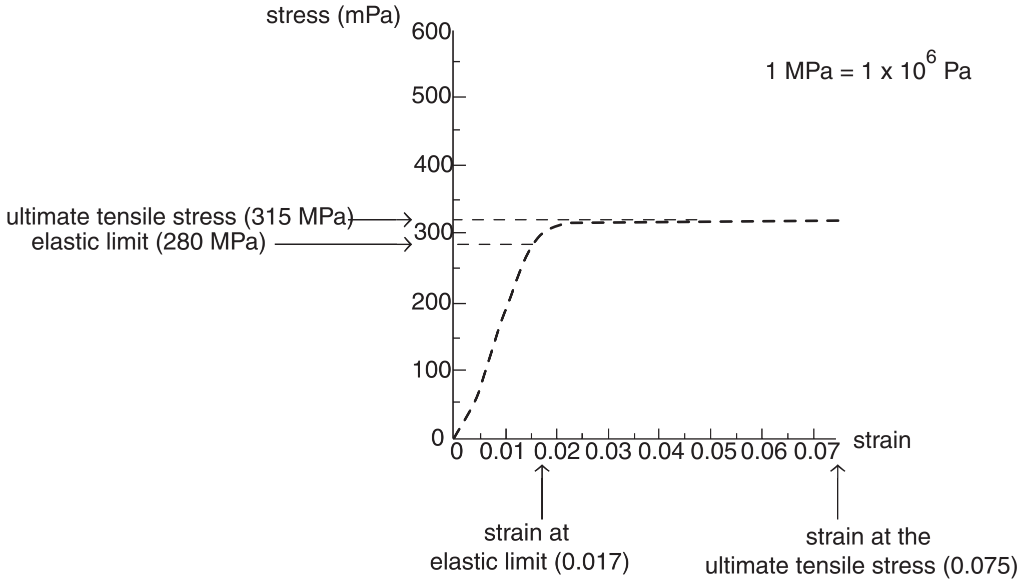


Figure 2

Question 3

Which one of the following is the best estimate for the Young's modulus of the material?

A. 16.5 GPa

B. 3.15 GPa

C. 2.80 GPa

D. 2.38 GPa

Question 4

The toughness of the material is closest to

A. 3.15×10^{8} J m^{-3}

B. 2.8×10^{8} J m^{-3}

C. 5.4×10^{7} J m^{-3}

D. 2.1×10^{7} J m^{-3}

A 50.000 m length of the material has a tensile stress of 280 MPa applied to it.

Question 5

The material is now of length

A. 54.150 m

B. 53.1750 m

C. 50.850 m

D. 49.150 m

When the 50.000 m length of the material is subjected to the applied stress of 280 MPa, it has a circular cross-sectional area with a diameter of 1.0 mm which it maintains throughout the application of the stress. The stress is produced by the hanging of a mass from the length of the material.

Question 6

The mass hung from the material to produce the applied stress is approximately

A. 280×10^6 kg
B. 220 kg
C. 93 kg
D. 22 kg

A new length of the material is subjected to a stress of 300 MPa.

Question 7

When the applied stress is removed the material

A. returns to its original position and shape.
B. returns to its original position and shape but is warmer than before the application of the stress.
C. is longer than its original length and has none of its internal chemical bonds broken.
D. is longer than its original length and has some of its internal chemical bonds broken.

The following information relates to Questions 8 to 10.

A traffic light hangs from the end of a pole that is hinged, without friction, to a vertical column and which is supported by a cable. The situation is shown in Figure 3.

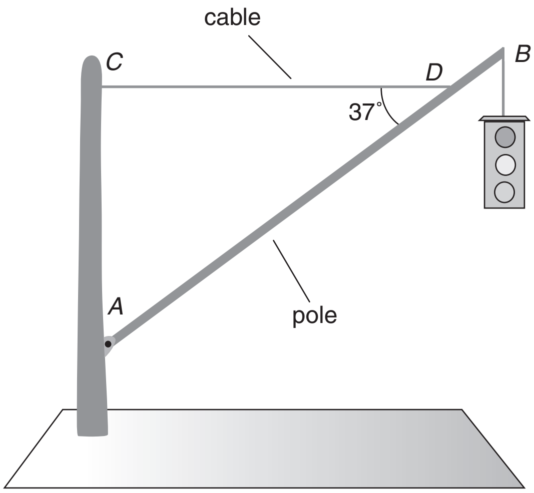


Figure 3

The pole *AB* is 7.20 m long and has a mass of 12.0 kg. The traffic light has a mass of 20.0 kg. The cable is of insignificant mass and is attached horizontally at point *D* on the pole. Point *D* is a distance of 6.31 m from end *A* of the pole. The cable makes an angle of 37° with the pole *AB*.

Question 8

Which of the following options best gives the magnitude of the torque about point *A* due to the weight of the traffic light?

A. 1440 Nm
B. 1150 Nm
C. 867 Nm
D. 200 Nm

Question 9

Which of the following best gives the torque provided by the cable about point *A*?

A. 320 Nm
B. 893 Nm
C. 1495 Nm
D. 2300 Nm

Question 10

Which one of the following best gives the tension in the cable?

A. 606 N
B. 394 N
C. 320 N
D. 235 N

A concrete slab is to be used as a viewing platform. People will stand on the platform to look out across a landscape. It is supported in its middle by a vertical concrete column. A stair is used to walk onto the platform but is not connected to the platform. The structure and its intended use is shown in Figure 4.

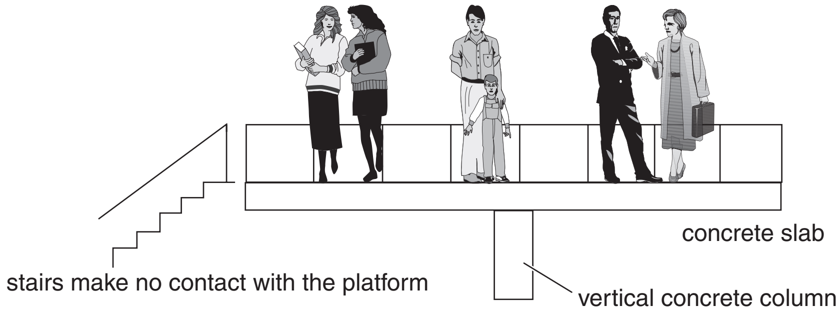


Figure 4

Prior to building the structure, the builder thinks the concrete alone will be insufficient to support a large crowd of sightseers standing on it, so the slab is to be built with iron rods embedded through it.

Question 11

Which of the options below best shows how steel should be used to reinforce the concrete slab?

A. 

B. 

C. 

D. 

Question 12

In the construction of a house, a timber frame is made as shown in Figure 5 below. The structure on the left shows the vertical timber struts that represent the frame of the wall. The structure on the right is an improved design. It shows the addition of two diagonal metal rods that brace (connect through) the timber and are bolted to the corner timbers.

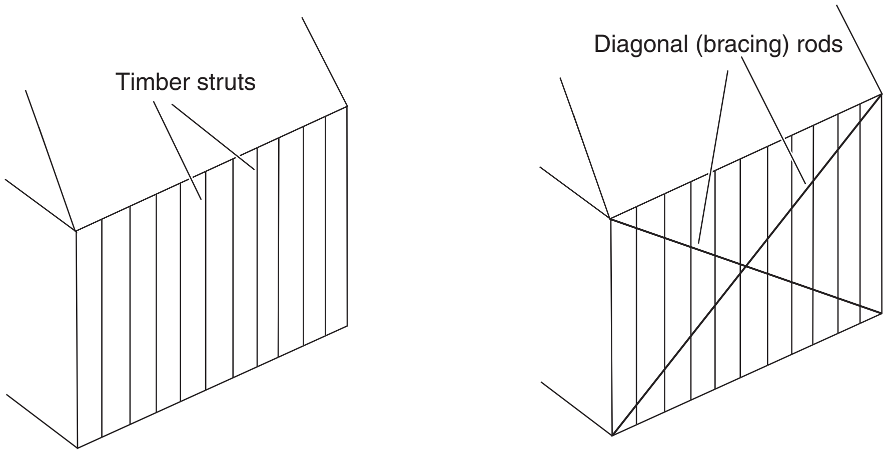


Figure 5

The improved design on the right in Figure 5

A. increases the compressive strength of the timber struts allowing the side of the house to support a greater vertical load.

B. increases the strength of the side of the house against shear forces.

C. allows equal compression or tension both vertically and horizontally at the same time in the case of movement of the foundation of the house.

D. reinforces the timber struts so that they can be stronger in compression as well as in tension.

A bridge is constructed as shown in Figure 6. Three sections of the bridge are labelled as members *X*, *Y* and *Z*. All the members are single (therefore not made up of two or more parts). All the members are bolted to each other and member *Z* is also bolted to the brick pylons.

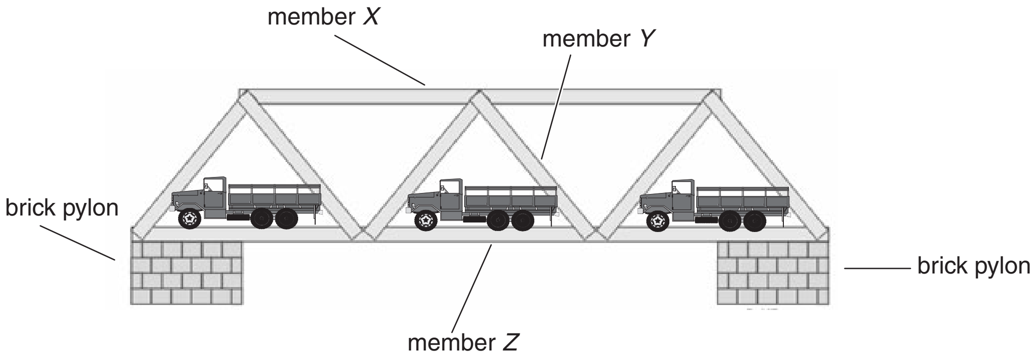


Figure 6

Question 13

Which of the following is correct about the forces (tension or compression) in members *X*, *Y* and *Z*?

	Member *X*	**Member *Y***	**Member *Z***
A.	compression	tension	compression
B.	tension	tension	tension
C.	compression	tension	tension
D.	compression	compression	compression

END OF DETAILED STUDY 2

Detailed study 3 – Further electronics

The following information relates to Questions 1 and 2.

Mains electricity in Australia is supplied at 240 V RMS.

Question 1

The frequency of the AC voltage supplied in Australia is

A. 10 Hz
B. 20 Hz
C. 50 Hz
D. 60 Hz

Question 2

The peak to peak voltage of the mains AC voltage supplied in Australia is

A. 240 V
B. $\frac{240}{\sqrt{2}}$ V
C. $240\sqrt{2}$ V
D. $480\sqrt{2}$ V

The following information relates to Questions 3 to 6.

A transformer (Figure 1) is used to change the 240 V RMS AC to 12 V RMS AC.

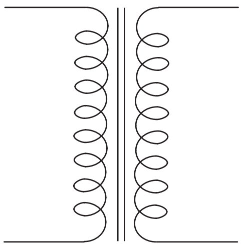


Figure 1

Question 3

The ratio of turns in the primary coils compared to the secondary coils of the transformer is

A. 1 : 20
B. 5 : 1
C. 10 : 1
D. 20 : 1

The input power to the transformer is 12 W.

Question 4

The current in the secondary coils of the transformer is

A. 0.05 A
B. 0.1 A
C. 0.5 A
D. 1.0 A

The output of the transformer is connected to a rectification circuit, as shown in Figure 2, which uses four 0.7 V diodes.

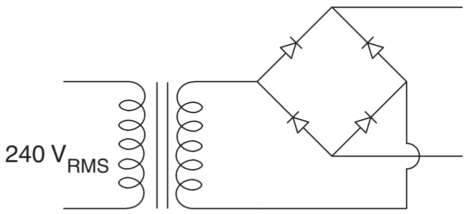


Figure 2

Question 5

The circuit shown in Figure 2 is best described as a

A. quarter wave rectification circuit.
B. half wave rectification circuit.
C. full wave rectification circuit.
D. one and a half wave rectification circuit.

Question 6

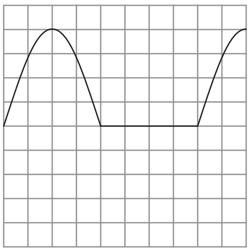
The peak voltage output of the bridge rectifier circuit is closest to

A. 10.6 V
B. 15.6 V
C. 16.3 V
D. 17.0 V

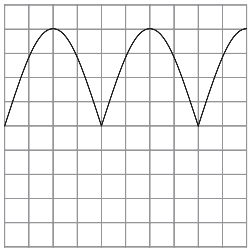
Question 7

Which of the following (**A**–**D**) best represents the output voltage as seen on a CRO?

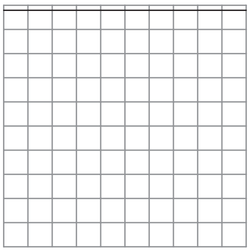
A.



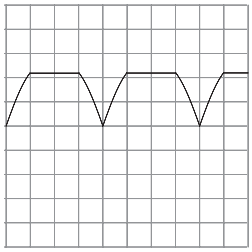
B.



C.



D.



2 marks

The following information relates to Questions 8 to 10.

A 15 μF capacitor is placed in parallel with a 10 kΩ load resistor, as shown in Figure 3, into the rectification circuit.

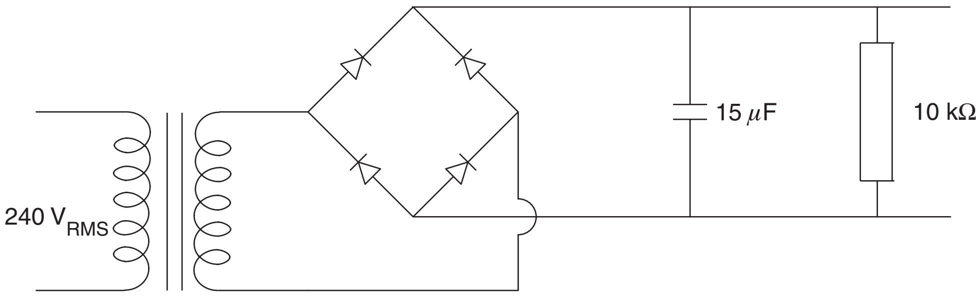


Figure 3

Question 8

The time constant for the RC circuit is

A. 0.03 s
B. 0.15 s
C. 1.5 s
D. 7.5 s

Question 9

The best description of the practical function of the capacitor in the RC circuit is

A. to store the electricity.
B. to smooth the output signal.
C. to create DC.
D. to create AC.

Question 10

The outside casing of the transformer feels very warm when touched.

The best explanation for this is

A. the transformer is converting electricity into sound.

B. the transformer has been designed with the wrong turns ratio.

C. the transformer is not 100% efficient.

D. the transformer is converting electricity into a changing magnetic field.

Figure 4 shows the current–voltage characteristic graph for one particular type of Zener diode voltage regulator.

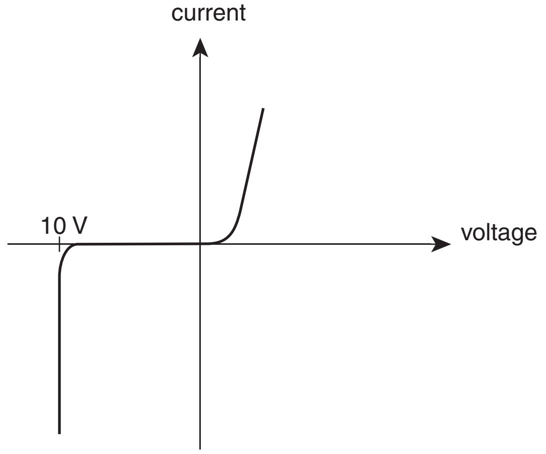


Figure 4

Question 11

The Zener diode shown in Figure 4 can be used in an electronic circuit as a voltage regulator by using the Zener diode

A. in forward bias at 0.7 V.

B. in reverse bias at –10 V.

C. in either forward bias at 0.7V or reverse bias at –10 V.

D. none of the above

The following information relates to Questions 12 and 13.

Multimeters are used in further electronics practical work to measure among other things voltage, current and resistance.

Question 12

To measure the voltage drop across a resistance component in a functioning low voltage circuit the multimeter is placed

A. in series with the resistance.
B. in parallel with the resistance.
C. either in series or in parallel with the resistance.
D. neither in series nor in parallel with the resistance.

Question 13

To measure the current through the resistance component in a functioning low voltage circuit the multimeter is placed

A. in a series with the resistance.
B. in parallel with the resistance.
C. either in series or in parallel with the resistance.
D. neither in series nor in parallel with the resistance.

END OF QUESTION AND ANSWER BOOKLET