VCE PHYSICS 2011

YEAR 12 TRIAL EXAM UNIT 4

Reading Time: 15 minutes **Writing Time: 1h 30m**

Structure of Booklet

Section	No of Questions	No of Questions to be answered	No of Marks
A. Core Area of Study			
1. Electric Power	18	18	40
2. Interactions of Light & Matter	13	13	26
B. Detailed Study			
1. Sound	12	12	24
		Total Marks	**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 a scientific calculator. Students are not permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials Supplied

Question and answers booklet with detachable data sheet.

Instructions

Detach the data sheet during reading time.
Write your name in the space provided.
Answer all questions in the question and answers booklet when indicated.
Also show your workings where space is provided.
Where an answer box has a unit printed in it, give your answer in that unit.
All responses must be in English.
Students are not permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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Data Sheet VCE Physics 2011 Year 12 Trial Exam Unit 4

1	photoelectric effect	$E_{K\max} = hf - W$
2	photon energy	$E = hf$
3	photon momentum	$p = \frac{h}{\lambda}$
4	de Broglie wavelength	$\lambda = \frac{h}{p}$
5	resistors in series	$R_T = R_1 + R_2$
6	resistors in parallel	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$
7	magnetic force	$F = IlB$
8	electromagnetic induction	$flux : \Phi = BA$; $emf : \varepsilon = -N\frac{\Delta\Phi}{\Delta t}$
9	transformer action	$\frac{V_1}{V_2} = \frac{N_1}{N_2}$
10	AC voltage and current	$V_{RMS} = \frac{1}{\sqrt{2}}V_{Peak}$ $I_{RMS} = \frac{1}{\sqrt{2}}I_{Peak}$
11	Voltage; power	$V = RI$ $P = VI$
12	transmission losses	$V_{Drop} = I_{Line}R_{Line}$ $P_{Loss} = I_{Line}^2 R_{Line}$
13	mass of the electron	$m_e = 9.1\times10^{-31}\ kg$
14	charge on the electron	$q = -1.6\times10^{-19}\ C$
15	Planck's constant	$h = 6.63\times10^{-34}\ J\ s$ $= 4.14\times10^{-15}\ eV\ s$
16	speed of light	$c = 3.0\times10^{8}\ m\,s^{-1}$
17	Acceleration due to gravity near the Earth's surface	g = 10 m s^{-2}

Detailed Study 3.3 – Sound

18	speed, frequency and wavelength	$v = f\lambda$ $T = \frac{1}{f}$
19	sound intensity and levels	sound intensity level $(in\ dB) = 10\log_{10}\left\{\frac{I}{I_0}\right\}$ $where\ I_0 = 1.0\times10^{-12}\ W\,m^{-2}$

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}

1 tonne = 10^{3} kg

Student Name....……………..………..…………………..

VCE Physics 2011 Year 12 Trial Exam Unit 4

Student Answer Sheet

Instructions: use a **PENCIL** for **ALL** entries. For each question, shade the box that indicates your answer.

All answers must be completed like **THIS** example.
Marks will **NOT** be deducted for incorrect answers.

A	B	C	D

NO MARK will be given if more than **ONE** answer is completed for any one question.
If you make a mistake, **ERASE** the incorrect answer – **DO NOT** cross it out.

SECTION B: Detailed Study 3.3. – Sound

One answer per line

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

VCE Physics 2011 Year 12 Trial Exam Unit 4

SECTION A – Core

Instructions for Section A
*Answer **all** questions **for both** Areas of study in this section in the spaces provided.*
Where an answer box has a unit printed in it, give your answer in that unit.
In questions where more than one mark is available, appropriate working should be shown.

Area of Study 1 – Electric power

Figure 1 shows a loop of insulated wire carrying a current passing through a cardboard sheet.

Question 1

Draw on **Figure 1** at least four lines to show the direction and shape of the magnetic field.

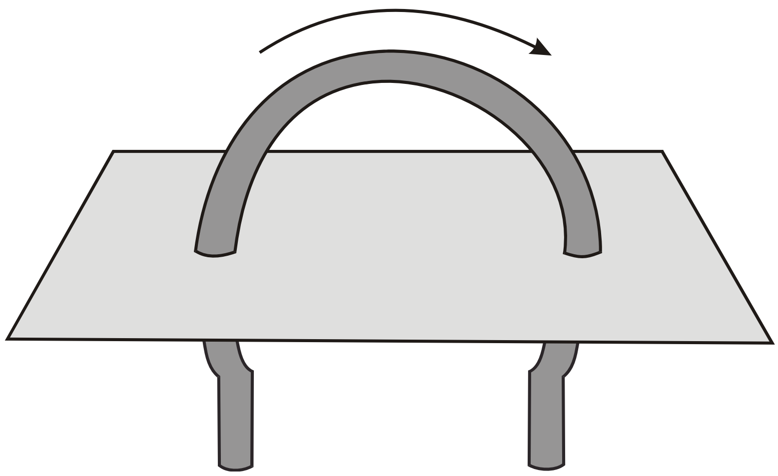


Figure 1

(2 marks)

Figure 2 shows an arrangement of two magnets.

Question 2

Indicate the polarity of each magnet in the boxes in **Figure 2**.

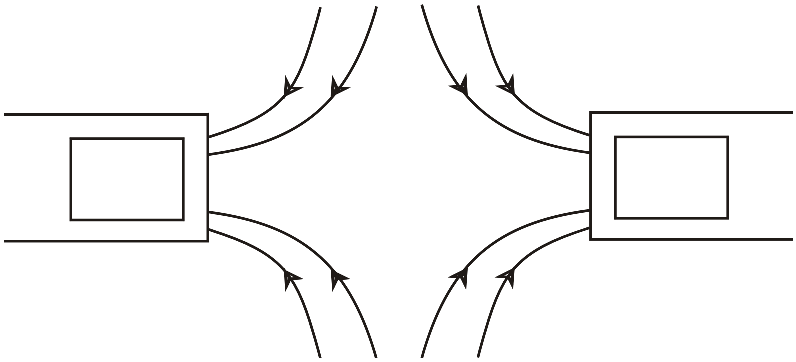


Figure 2

(2 marks)

Figure 3 shows a wire carrying a current positioned between two magnetic poles. The direction of the force on the wire, when a current flows in the wire, is shown by the arrow.

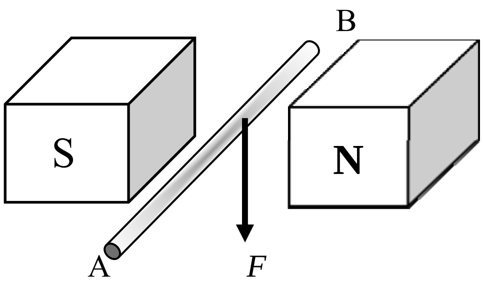


Figure 3

Question 3

State the direction of current flow in terms of A and B.

____

(2 marks)

Question 4

Calculate the magnitude of the force acting on the wire in **Figure 3,** if the magnetic field strength at the wire is 0.075 tesla, the length of the wire is 3.0×10^{-2} m and the magnitude of the current through the wire is 2.0 A.

	N

(2 marks)

Questions 5 – 8 refer to the following information.

Figure 4 is a diagram of a simple alternator. A coil (UVWX) of dimensions UV = XW = 0.40 m, and VW = UX = 0.30 m, consists of 30 turns of insulated wire. The coil is placed as shown in **Figure 4** in a uniform magnetic field of strength 0.20 T. The direction of rotation of the coil is indicated.

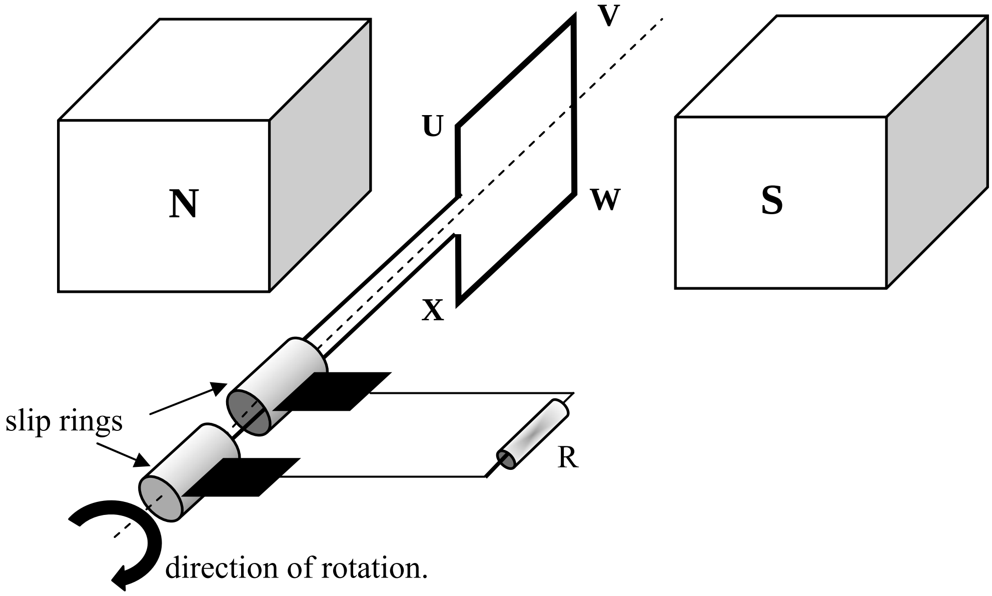


Figure 4

Question 5

With the coil oriented as shown in **Figure 4**, what is the magnitude of the magnetic flux passing through the coil?

Wb

(2 marks)

The coil is now rotated at a constant rate of 10 Hz in the direction shown.

Question 6

Calculate the magnitude of the average potential difference generated across resistor R when the coil rotates through 90^0 from the orientation shown in **Figure 4**.

V

(3 marks)

Figure 5 shows graphs of possible variations of the magnetic flux through the coil as a function of time as the coil rotates. The coil is oriented as shown in **Figure 4** at time t = 0.

Question 7

Which of the graphs (**A – D**) below best shows the variation of the magnetic flux through the coil as a function of time? (The direction N to S is positive).

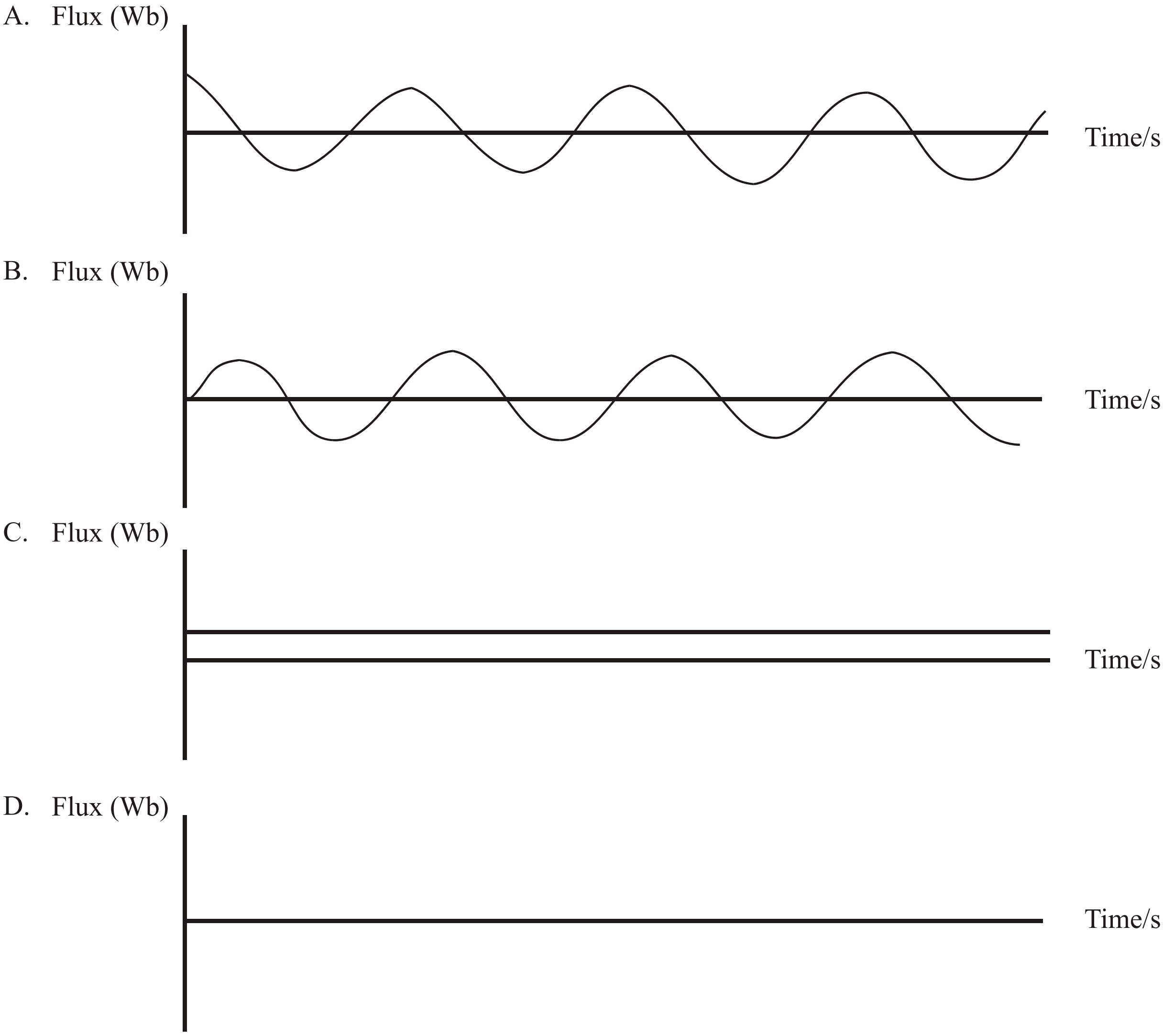


Figure 5

(2 marks)

The graphs in **Figure 5** can also be used to indicate variations of the EMF through resistor R as a function of time as the coil rotates. The coil is oriented as shown in **Figure 4** at time t = 0.

Question 8

Which of the graphs in **Figure 5** (**A – D**) best shows the variation of EMF across resistor R as a function of time?

(2 marks)

A solenoid and a pivoted compass needle are placed side by side as shown in **Figure 6**.

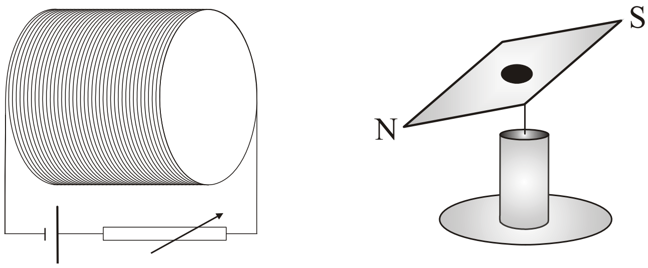


Figure 6

Question 9

Choose one of the arrows (**A – D**) in **Figure 7** to indicate the direction of motion of the N pole of the pivoted compass needle when current is flowing in the solenoid.

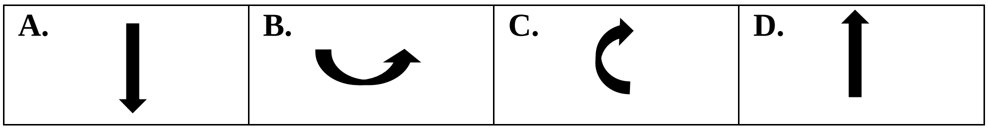


Figure 7

(2 marks)

Questions 10 and 11 refer to the following information.
Figure 8 shows a simple diagram of a DC electric motor.

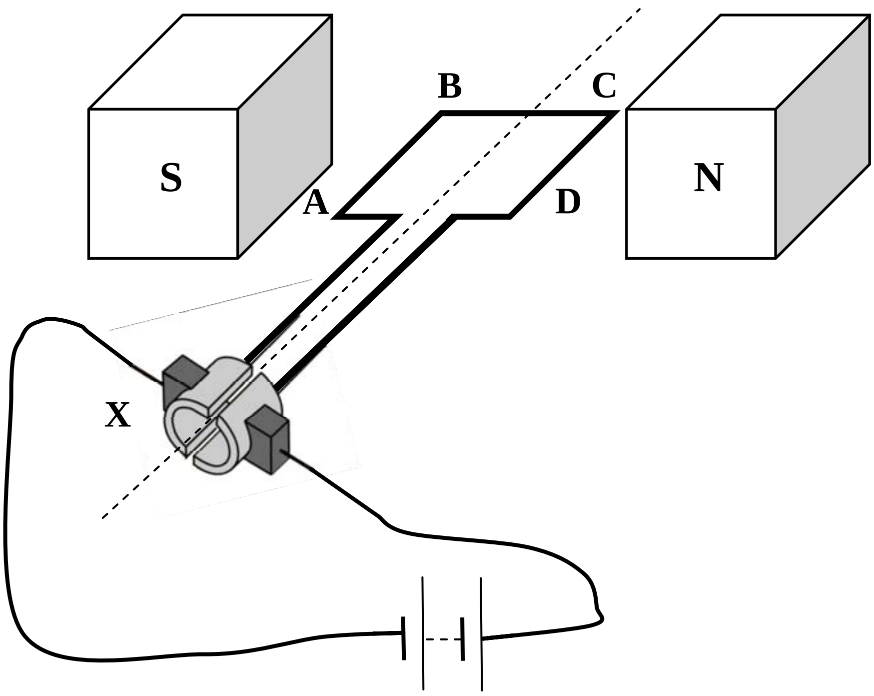


Figure 8

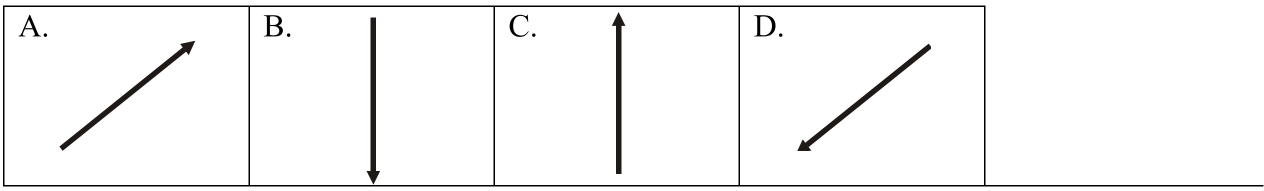


Figure 9

Question 10
Choose one of the arrows (**A – D**) in **Figure 9** to indicate the direction of the force on side CD as shown in **Figure 8**.

(2 marks)

Question 11

Name component **X** in **Figure 8** and describe its function in the DC motor.

name of component X:

____

____

____

____

(3 marks)

Questions 12 and 13 refer to the following information.

Two solenoids, placed side by side as shown in **Figure 10**, are functioning together as an ideal transformer. The first solenoid has a coil of 200 turns and the second solenoid has a coil of 40 turns. An AC power supply provides the first solenoid with a current of 0.30 A.

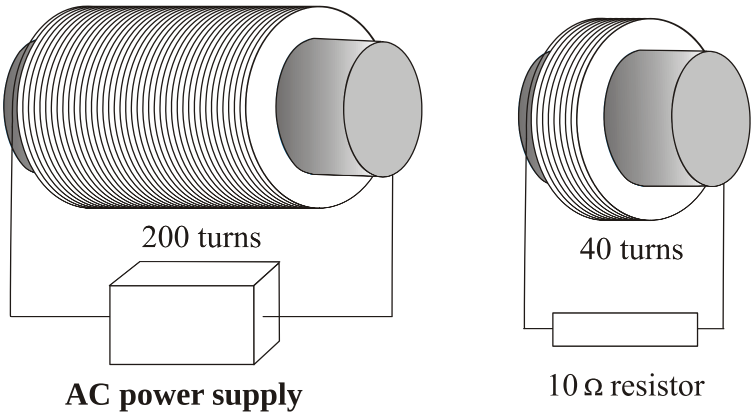


Figure 10

Question 12

Calculate the peak – peak current in the solenoid of 200 turns.

A

(2 marks)

Question 13
Calculate the power dissipated in the 10 Ω resistor connected to the second coil.

W

(3 marks)

The following information relates to questions 14 – 17.
Figure 11 shows a transmission system designed to deliver 300 MW of electric power to a town that is distant from the generating plant. The generating plant has an input voltage to the system of 500 kV. The power loss in the transmission lines to the town is 20 MW.

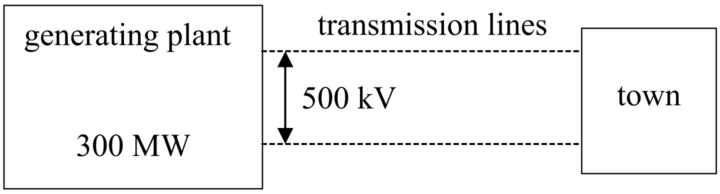


Figure 11

Question 14
Calculate the current in the transmission wires.

A

(2 marks)

Question 15
Calculate the supply voltage, in kV, at the town.

kV

(2 marks)

Question 16
Calculate the total electrical resistance of the transmission wires.

Ω

(2 marks)

Question 17
Explain why transmission lines are at very high voltages.

(3 marks)

AC domestic power in Australia is described as 240 V RMS with a frequency of 50 Hz. All electrical appliances must carry this information.

Question 18
Which one of the graphs (A – D) in **Figure 12** best represents the output voltage of a domestic AC power point?

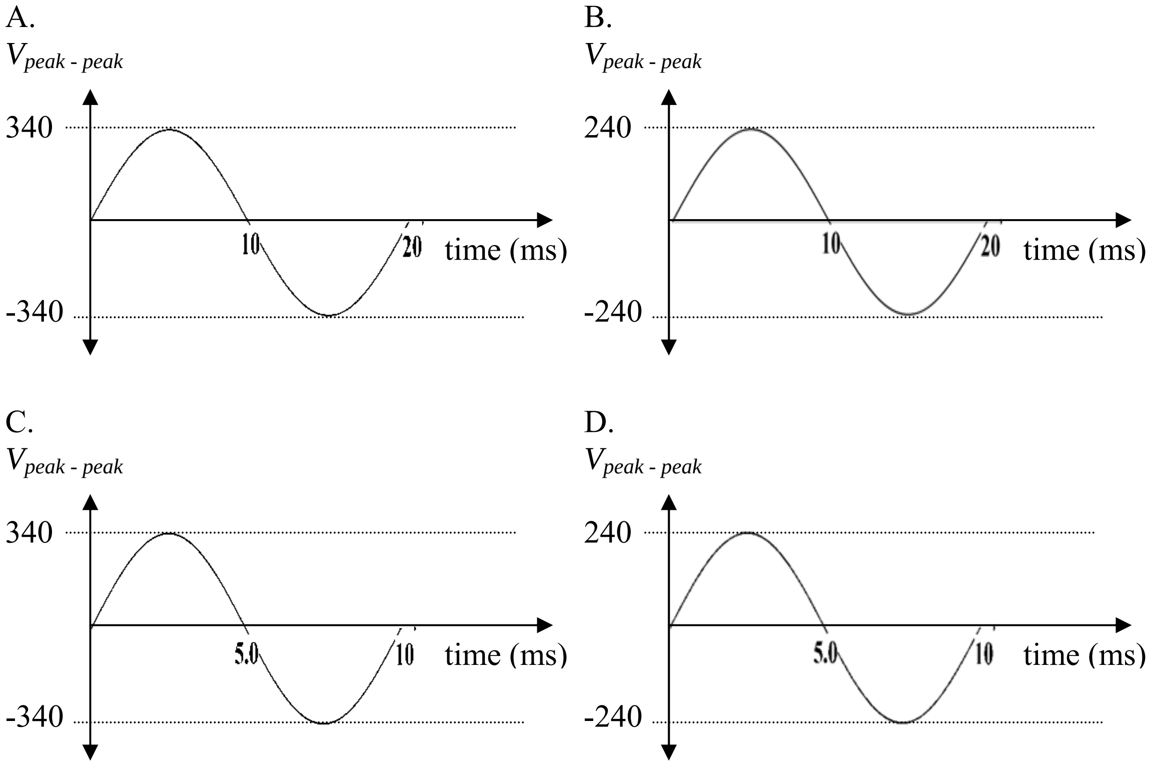


Figure 12

(2 marks)

Area of Study 2 – Interactions of Light and Matter

A double-slit experiment was carried out with light of wavelength 380 nm. The light was directed through two slits as shown in **Figure 1**. Point M is exactly the same distance from both slits, X and Y, and points P and M are located on a screen a short distance from the slits. The distance (PY – PX) is 9.5×10^{-7} m.

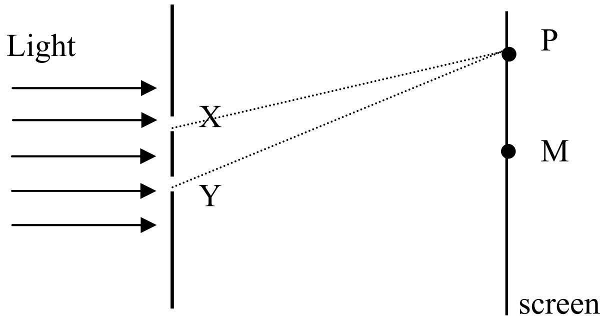


Figure 1

Question 1
Show by calculation that there is a dark fringe at point P on the screen.

(2 marks)

Question 2
Explain why the fringe at point P is dark.

___

___

(2 marks)

Question 3
The width of slits X and Y must be small enough for diffraction of the light passing through them. Explain why diffraction of the light is essential for the pattern to form.

___

___

___

(3 marks)

Question 4
Which one of the following statements, **A – D**, describes the important contribution made to our understanding of light by the photoelectric effect?

A	Light of greater intensity possessed more energy.
B	The 'wave theory' was proven to be completely wrong.
C	The 'wave theory' was proven to be completely correct.
D	Light consists of discrete particles each with a certain quantum of energy.

(2 marks)

The diffraction pattern on the left in **Figure 2** was made by a beam of X-rays passing through thin aluminium foil. The diffraction pattern on the right in **Figure 2** was made by a beam of electrons passing through the same foil.

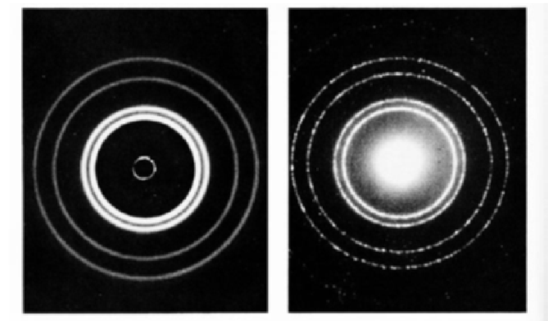


Figure 2

In one experiment, X-rays with a wavelength of 8.4×10^{-10} m were fired at an aluminium foil.

Question 5
Calculate the momentum of the X-rays.

Kg m s^{-1}

(2 marks)

Question 6
Calculate the speed of the electron beam that produces the same diffraction pattern as the X-rays as shown in **Figure 2**.

m s^{-1}

(2 marks)

Question 7
Which one of the following statements best explains why X-rays and fast moving electrons can produce similar diffraction patterns when they are fired at thin aluminium foil?

A	X-rays are rapidly moving electrons.
B	Both X-rays and fast-moving electrons are exhibiting particle behaviour when passing through the aluminium.
C	Both X-rays and fast-moving electrons are exhibiting wave-like behaviour when passing through the aluminium.
D	The electrons are travelling at the speed of light and so produce the same effect as the X-rays.

(2 marks)

Davison and Germer used electrons with a kinetic energy of 54 eV to investigate the crystal structure of the metal nickel. Electrons with this energy possess a de Broglie wavelength of 1.67×10^{-10} m.

The atomic spacing in the nickel crystal is 2.2×10^{-10} m

Question 8
Use calculations to show that electrons with this de Broglie wavelength can be used in this experiment but not visible light of wavelength 500 nm. Justify your answer.

(3 marks)

Questions 9 and 10 refer to the following information.

In an experiment to investigate the photoelectric effect, monochromatic light was shone onto a clean metal surface. The maximum kinetic energy of the ejected electrons was measured and plotted on a graph against frequency of the incident light. The experiment was repeated with different monochromatic frequencies of light and the kinetic energy of the ejected photoelectrons was plotted against the frequency as shown in **Figure 3**.

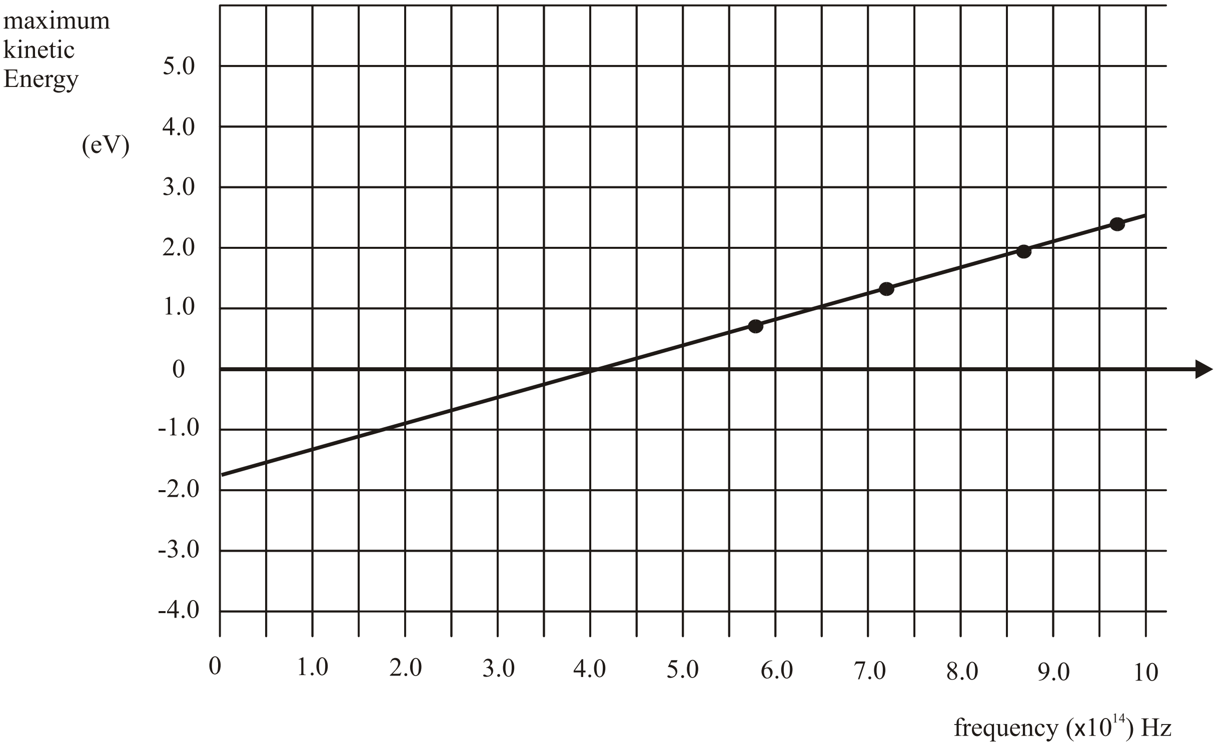


Figure 3

Question 9

Determine the minimum photon energy, in eV, that can eject an electron from this metal.

eV

(2 marks)

Question 10

Choose one of the alternatives, **A – D,** from the table of metals and their work functions that identifies the metal used in **Question 9.**

	metal	work function (eV)
A	potassium	1.7
B	lithium	2.3
C	magnesium	3.7
D	chromium	4.6

(1 mark)

Monochromatic light of wavelength 580 nm is shone onto a clean metal surface in a photocell and photoemission is observed. A potential difference of 0.20 V is needed to stop the photoelectric emission.

Question 11

Calculate the work function, in eV, of the metal in the photocell.

eV

(2 marks)

Figure 4 represents a standing circular wave that represents the amplitude of an electron matter wave.

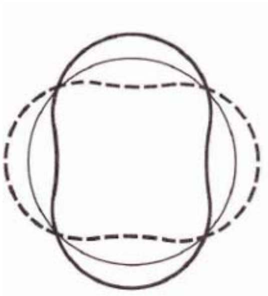


Figure 4

Question 12

The number of wavelengths or quantum number, *n,* shown in **Figure 4** is;

A	1
B	2
C	4
D	6

(1 mark)

Figure 5 shows some of the energy levels in the neutral hydrogen atom. *(not drawn to scale)*

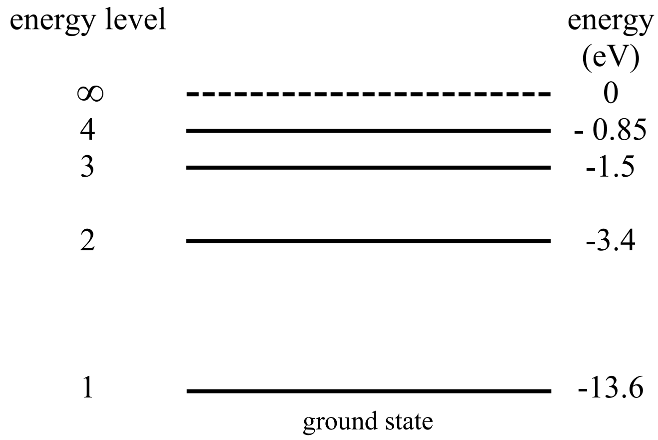


Figure 5

When the atom makes a transition from a higher to a lower energy level, a photon is emitted.

Question 13

Calculate the wavelength, in nm, of the photon emitted in the transition from energy level 3 to energy level 2.

nm

(2 marks)

End of Section A

VCE Physics 2011 Year 12 Trial Exam Unit 4

SECTION B – Detailed Study

Instructions for Section B
*Answer **all** questions from the Detailed study, 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.

Detailed Study 3.3 – Sound

Questions 1 and 2 refer to the following information.
Sounds of different frequency and the same intensity do not seem equally loud to us. We are more sensitive to some frequencies than to others.

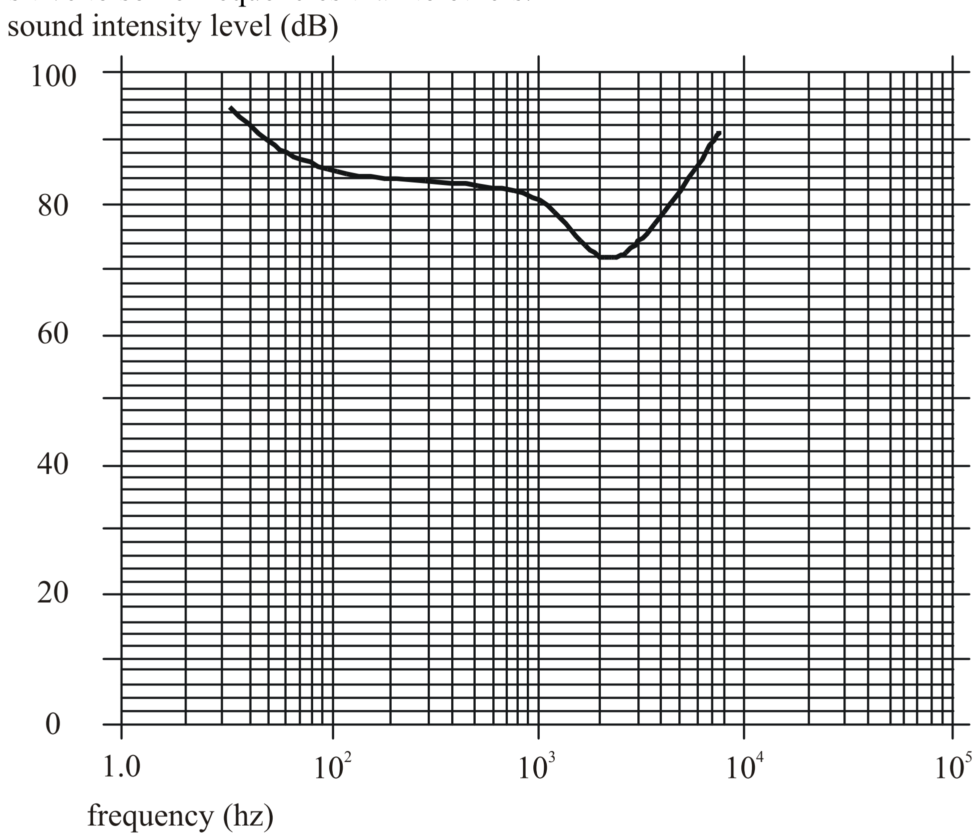


Figure 1

Question 1
On **Figure 1** the frequency most easily heard by the normal ear would be closest to
A. 30 Hz
B. 3000 Hz
C. 10^4 Hz
D. 3.0 Hz

Question 2

On **Figure 1** a 1000 Hz sound at 80 dB is taken as a loudness standard.
Which one of the following frequency – loudness values would sound equally loud as the standard?

A. 3.0 Hz; 94 dB
B. 100 Hz; 80 dB
C. 300 Hz; 80 dB
D. 8000 Hz; 90 dB

Sound reproduction equipment also shows variability and limitations in response to the input of different frequencies. **Figure 2** shows the frequency response of a particular loudspeaker.

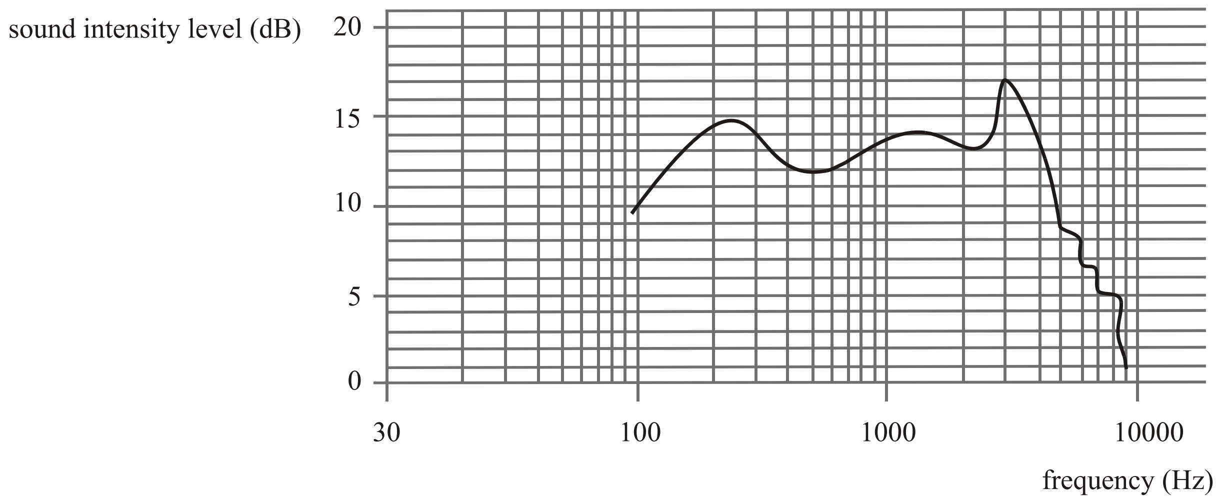


Figure 2

Question 3

This speaker responds best to frequencies between about

A. 200 Hz and 4000 Hz
B. 100 Hz and 200 Hz
C. 3000 Hz and 9000 Hz
D. 500 Hz and 2500 Hz

Questions 4 – 7 refer to the following information.
A didgeridoo can be modeled as a 1.25 m pipe that is **open at both ends**, as shown in **Figure 3**. Use speed of sound = 340 ms^{-1}

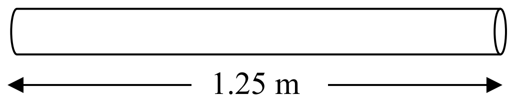
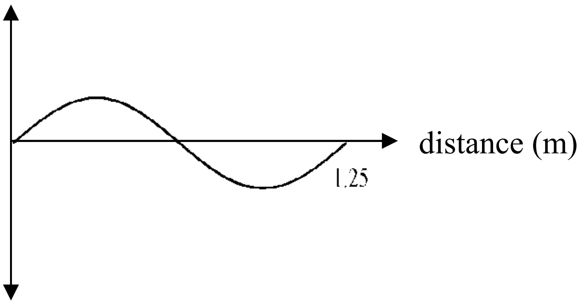


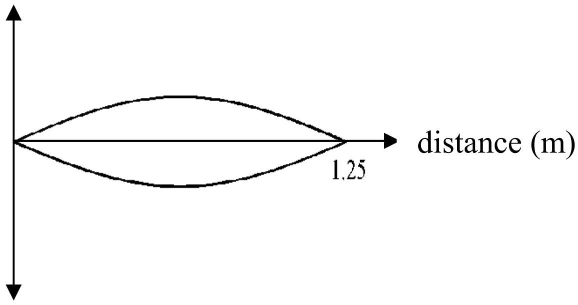
Figure 3

Question 4
Which one of the following graphs, **A – D**, shows the pressure variation of the air inside the pipe when a sound of fundamental frequency is being emitted.

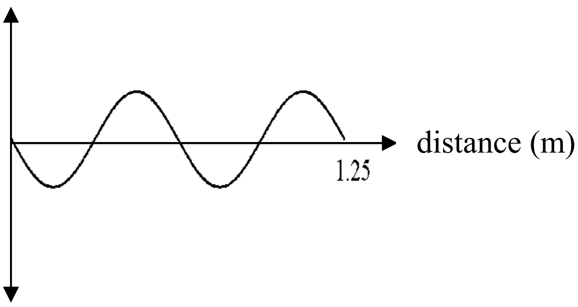
A. Pressure variation



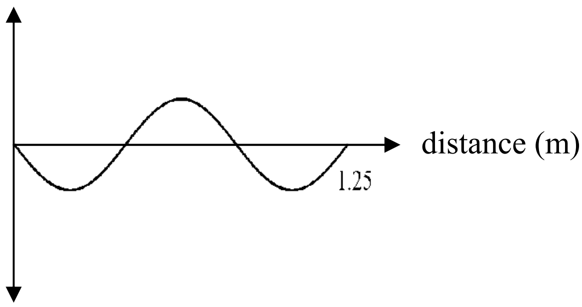
B. Pressure variation



C. Pressure variation



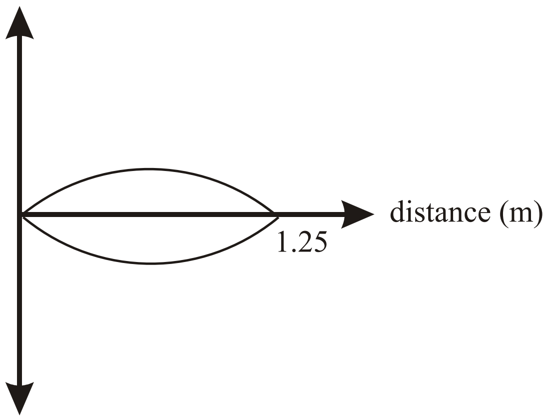
D. Pressure variation

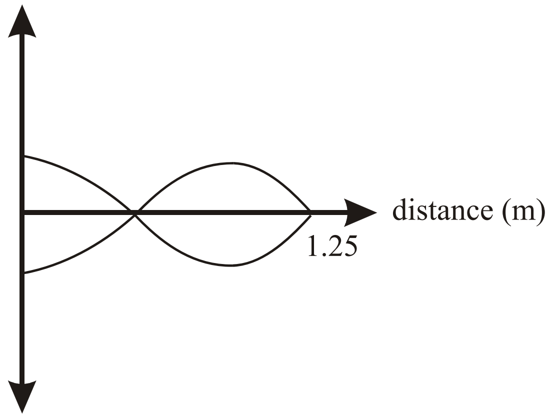


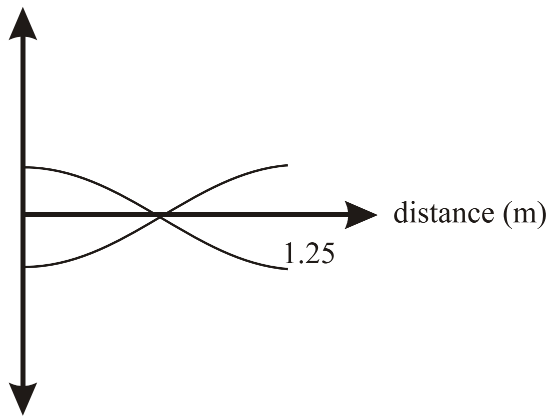
Question 5
The wavelength of this sound of fundamental frequency is
A. 0.625 m
B. 1.25 m
C. 2.5 m
D. 1.88 m

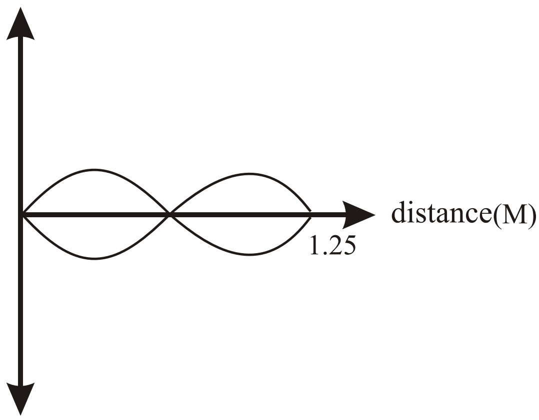
Question 6
The fundamental frequency of this particular pipe is
A. 272 Hz
B. 136 Hz
C. 68 Hz
D. 34 Hz

Question 7
Sounds of only a few frequencies could be generated by this didgeridoo. Choose one of the graphs, **A – D**, that shows the maximum and minimum values of the pressure variation along the tube for the next higher frequency above the fundamental.

A. Pressure variation


B. Pressure variation


C. Pressure variation


D. Pressure variation


Question 8
The sound intensity level at a distance of 2.0 m from a running motor is 90 dB. Which one of the alternatives, **A – D**, gives the sound intensity at a distance of 2.0 m from the motor?
A. $2.0\times10^{-3}\ \mathrm{W\,m^{-2}}$
B. $1.0\times10^{-3}\ \mathrm{W\,m^{-2}}$
C. $5.0\times10^{-4}\ \mathrm{W\,m^{-2}}$
D. $1.0\times10^{-4}\ \mathrm{W\,m^{-2}}$

Question 9

The sound intensity at a distance of 4.0 m from the running motor would be

A. 4.0×10^{-3} W m^{-2}

B. 2.5×10^{-4} W m^{-2}

C. 2.5×10^{-3} W m^{-2}

D. 1.0×10^{-3} W m^{-2}

Question 10

Which one of the alternatives, **A – D**, is used to avoid cancellation between the sound waves produced at the front and rear of the speaker, which have a phase difference of 180° due to the back and forth motion of the speaker?

A. An enclosure.
B. A reflector.
C. A diaphragm.
D. A baffle board.

Question 11

Which one of the alternatives, **A – D**, best describes an electret microphone?

A. When a magnet is moved near a coil of wire, an electrical current is generated in the wire. Using this electromagnet principle, this microphone uses a wire coil and magnet to create the audio signal.

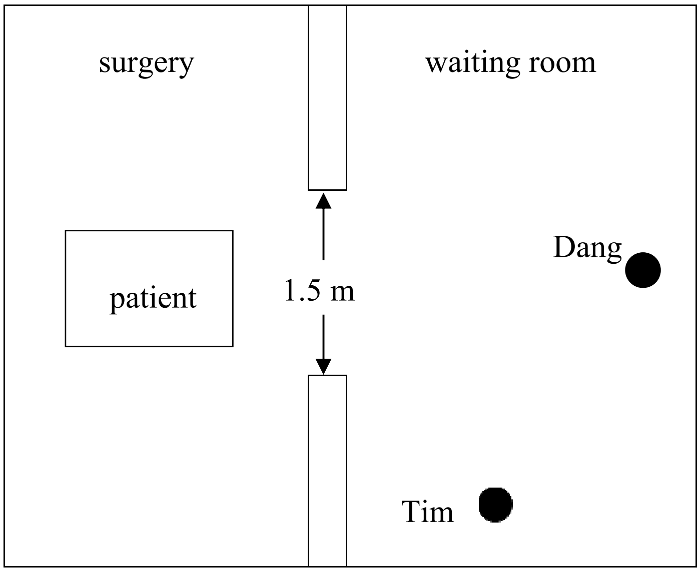
B. In this microphone, one of the plates is made of very light material and acts as the diaphragm. The diaphragm vibrates when struck by sound waves, changing the distance between the two plates and therefore changing the capacitance.

C. This microphone works as a capacitor microphone, except a permanent (electrostatic) charge applied to the microphone during manufacture removes the need for phantom power.

D. This microphone utilises the 'piezoelectric effect'. Piezo electric solids produce a voltage between surfaces when a mechanical stress is applied. Conversely they exhibit deformation when a voltage is applied.

Question 12

A dentist's waiting room and surgery are shown. A patient is being treated with a drill that produces a sound of frequency 4500 Hz. The patient is groaning with a frequency of 150 Hz. Dang and Tim are seated in the waiting room as shown, awaiting treatment. The door into the surgery is 1.5 m wide and the door is open. Which one of the alternatives, **A – D**, will apply in this situation?



A. The sound of the drill is heard more loudly by Tim than by Dang.
B. The sound of the groaning is heard more loudly by Dang than by Tim.
C. The sound of the groaning is heard more loudly by Tim than by Dang.
D. The sound of the drill is heard equally loudly by Dang and Tim.

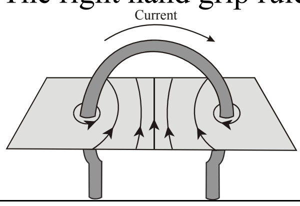
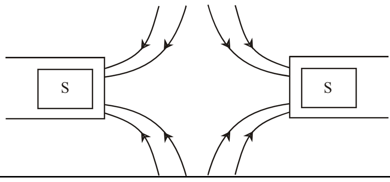
End of Section B

End of Trial Exam

Suggested Answers

VCE Physics 2011 Year 12 Trial Exam Unit 4

SECTION A – Core

Questions	Area of Study 1 – Electric Power	Mark Allocation
1	The right hand grip rule is used to show the field line directions. 	2
2	The field lines show that each pole is a south pole. 	2
3	The right hand slap rule will show that the current through the wire flows from B to A.	2
4	Use; $F = BIl$ $= 0.075 \times 2.0 \times 3.0 \times 10^{-2}$ $= 4.5 \times 10^{-3}$N	1 1
5	Use; $\phi = BA$ $= 0.20 \times 0.30 \times 0.40$ $= 2.4 \times 10^{-2}$ Wb	1 1
6	Use; $\xi = -N\dfrac{\Delta\phi}{\Delta t}$ $= -30 \times \dfrac{(0 - 0.024)}{0.025}$ $= 29$ V	2 1
7	At time $t = 0$ the flux through the coil is a maximum and decreasing. Graph A	2
8	At time t = 0 the EMF is zero. As time increases, the EMF increases. Graph B	2

9	The end of the solenoid facing the compass needle will have a north polarity. The north pole of the pivoted magnet will be repelled. Answer: arrow B	1 1
10	Use the right hand slap rule. The current flows from D to C. The force on the wire will be vertically down. Arrow C.	1 1
11	Component X is a commutator. The commutator is mounted on the motor shaft and every half revolution of the commutator, the connections to the two brushes is changed and the current in the coil reverses. This action maintains a continuous revolution of the coil.	1 1 1
12	Use; $I_{P-P} = 0.30 \times 2\sqrt{2}$ $= 0.85\ \text{A}$	1 1
13	Use; $\frac{N_1}{N_2} = \frac{I_2}{I_1}$ $\frac{200}{40} = \frac{I_2}{0.30}$ $I_2 = \frac{200 \times 0.30}{40}$ $= 1.5\ \text{A}$ $P = I^2\ R$ $= (1.5)^2 \times 10$ $= 23\ \text{W}$	1 1 1
14	Use; $I = \frac{P}{V}$ $= \frac{300 \times 10^6}{500 \times 10^3}$ $= 600\ \text{A}$	1 1
15	The power available to the town is $(300 \times 10^6 - 20 \times 10^6)\ \text{W}$ $= 280 \times 10^6\ \text{W}$ The current in the wires is 600 A, so the voltage available to the town is; $V = \frac{P}{I}$ $= \frac{280 \times 10^6}{600}$ $= 470\ kV$	1 1

16	Use; $P = I^2R$ $R = \frac{P}{I^2}$ $= \frac{20 \times 10^6}{600 \times 600}$ $= 56\ \Omega$	1 1
17	Electricity transmitted over long distances suffers from power loss due to the resistance of the lines. To reduce power losses in transmission, low line resistance and a high transmission voltage at low current are used. Power loss in the lines carrying current is directly proportional to the square of the current.	1 1 1
18	The frequency of the supply is 50 Hz. The period of the AC supply is then 0.020 s or 20 ms. The peak-peak voltage of the domestic supply is ± 340 V. Answer: graph A.	2

Questions	Area of Study 2 – Interactions of Light & Matter	Mark Allocation
1	$PY - PX = 950\ nm$ $\lambda = 380\ nm$ $\frac{950}{380} = 2.5$ So the path difference is 2.5 λ and the fringe is dark.	1 1
2	When rays from each slit travel to the screen and meet, if the distance travelled by one ray differs by a factor of half, destructive interference occurs, the point where they meet will be a dark fringe.	1 1
3	Monochromatic light falls on the two slits and because of diffraction, the waves leaving the slits spread out and produce an interference pattern on a screen. The amount of diffraction depends on the slit width and the wavelength of the light, and the wavelength of the light must be of a similar order of magnitude to the slit width for significant diffraction to occur.	1 1 1
4	Answer D. Light consists of discrete particles, each with a quantum of energy proportional to the frequency of the particle. Incident photons must have a minimum amount of energy to eject an electron from the surface of the metal. Light of greater intensity only increases the number of photoelectrons emitted.	1 1
5	Use; $\lambda = \frac{h}{p}$ $p = \frac{h}{\lambda}$ $= \frac{6.67 \times 10^{-34}}{8.4 \times 10^{-10}}$ $= 7.9 \times 10^{-25}\ \text{kg ms}^{-1}$	1 1
6	Use; $v = \frac{h}{m\lambda}$ $= \frac{6.67 \times 10^{-34}}{(9.1 \times 10^{-31})(8.4 \times 10^{-10})}$ $= 8.7 \times 10^{5}\ \text{m s}^{-1}$	1 1
7	Answer C. Both X-rays and fast moving electrons exhibit wave-like behaviour when passing through the aluminium.	2

8	For visible light; $diffraction = \frac{\lambda}{w}$ $= \frac{500 \times 10^{-9}}{2.2 \times 10^{-10}}$ $= 2300$ For electrons; $diffraction = \frac{\lambda}{w}$ $= \frac{1.67 \times 10^{-10}}{2.2 \times 10^{-10}}$ $= 0.76$ Significant diffraction will only occur with the fast moving electrons as they have a wavelength of the same order of magnitude as the crystal spacing.	1 1 1
9	Read from the graph; the cut-off frequency is 4.2×10^{14} Hz. Use; $E = hf$ $= 4.14 \times 10^{15} \times 4.2 \times 10^{14}$ $= 1.74$ eV	1 1
10	Answer A. Determined from Question 9 or the energy intercept. The metal could be potassium	1
11	To calculate the work function; Use; $E_{K\max} = hf - W$ $W = hf - E_{K\max}$ $= \frac{(4.14 \times 10^{-15})(3.0 \times 10^{8})}{580 \times 10^{-9}} - 0.20$ $= 1.9$ eV The work function is 1.9 eV.	1 1
12	The whole number of wavelengths that fit into the circumference of the circle is 2. Answer B.	1
13	Use; $\Delta E = -1.5 - (-3.4)$ $= 1.9$ eV $E = \frac{hc}{\lambda}$ $\lambda = \frac{4.14 \times 10^{-15} \times 3.0 \times 10^{8}}{1.9}$ $= 654$ nm	1 1

SECTION B – Detailed Study

Question	Answer	Detailed Study 3.3 – Sound
1	**B**	The lowest point on the curve 3000 Hz.
2	**D**	The ordered pair that lies on the standard curve.
3	**A**	The approximate 'linear range' would give best response.
4	**B**	The fundamental would have one antinode and nodes at each end.
5	**C**	The fundamental wavelength would be $2 \times 1.25 = 2.50\,\text{m}$
6	**B**	Use; $v = f\lambda$ $f = \frac{v}{\lambda}$ $= \frac{340}{2.50}$ $= 136\ \text{Hz}$
7	**D**	The next higher frequency would have pressure variation in the tube as shown by graph D.
8	**B**	Use; $90 = 10\ \log_{10}\frac{I_1}{I_0}$ $9.0 = \log_{10}\frac{I_1}{I_0}$ $I_1 = 10^9 \times 10^{-12}$ $= 1.0 \times 10^{-3}\ \text{W m}^{-2}$
9	**B**	Use; $I_1 d_1^{\ 2} = I_2 d_2^{\ 2}$ $I_2 = \frac{(1.0 \times 10^{-3})(2.0)^2}{4.0^2}$ $= 2.5 \times 10^{-4}\ W\,m^{-2}$.
10	**D**	A baffle board is used to avoid cancellation between the sound waves produced at the front and rear of the speaker which have a <u>phase</u> difference of 180° due to the back and forth motion of the speaker.
11	**C**	An electret microphone operates like a capacitor microphone, except for a permanent charge applied to the microphone during manufacture that removes the need for 'phantom power'.
12	**B**	The sound of the groaning is heard more loudly by Dang than by Tim.

End of Suggested Answers