



**B O A R D O F S T U D I E S**  
NEW SOUTH WALES

## **2009 HSC Physics Marking Guidelines**

### **Section I, Part A**

<b>Question</b>	<b>Response</b>
1	C
2	A
3	C
4	D
5	C
6	A
7	C
8	C
9	A
10	B
11	B
12	D
13	B
14	C
15	A

**Section I, Part B****Question 16 (a)***Outcomes assessed: H6, H9, H12***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Correctly calculates weight of space craft on Earth	1

**Question 16 (b)***Outcomes assessed: H6, H9, H12***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Substitutes correctly to calculate mass	2
• Uses formula correctly, but makes an error in substitution	1

**Question 17 (a)***Outcomes assessed: H6, H11, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Draws diagrams of a valid experimental set up</li><li>• Uses labels on the diagrams to show how the experimental set up enabled a distinction to be made between inertial and non-inertial frames of reference</li></ul> OR <ul style="list-style-type: none"><li>• Draws a labelled diagram and describes the difference between inertial and non-inertial frames of reference</li></ul>	2
<ul style="list-style-type: none"><li>• Draws a diagram of a valid experimental set up</li></ul> OR <ul style="list-style-type: none"><li>• States how to distinguish between an inertial and non-inertial frame of reference</li></ul>	1

**Question 17 (b)***Outcomes assessed: H6, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Describes the major principles of relativity</li><li>• Relates how the principles of relativity applies for inertial frames of reference</li></ul>	3
<ul style="list-style-type: none"><li>• Describes some features of relativity</li></ul> OR <ul style="list-style-type: none"><li>• Defines inertial and non-inertial frames of reference</li></ul> OR <ul style="list-style-type: none"><li>• Defines an inertial OR non-inertial frame of reference and links to a principle of relativity</li></ul>	2
<ul style="list-style-type: none"><li>• Makes a general statement about EITHER the theory of special relativity OR inertial frames of reference</li></ul>	1

**Question 18 (a)***Outcomes assessed: H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Substitutes correctly to calculate distance in light years</li></ul> OR <ul style="list-style-type: none"><li>• Substitutes correctly to calculate distance in SI units</li></ul>	2
<ul style="list-style-type: none"><li>• Uses formula correctly but makes an error in substitution</li></ul>	1

**Question 18 (b)***Outcomes assessed: H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Substitutes correctly to calculate time in light years</li></ul> OR <ul style="list-style-type: none"><li>• Substitutes correctly to calculate time in SI units</li></ul>	2
<ul style="list-style-type: none"><li>• Uses formula correctly but makes an error in substitution</li></ul>	1

**Question 19 (a)***Outcomes assessed: H6, H9, H12, H13***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Substitutes correctly to determine the force</li></ul>	3
<ul style="list-style-type: none"><li>• Combines TWO appropriate equations AND EITHER</li><li>• Makes an error in rearranging the equations OR</li><li>• Makes an error in substitution</li></ul>	2
<ul style="list-style-type: none"><li>• Chooses one correct formula and attempts to find the force or electric field</li></ul>	1

**Question 19 (b)***Outcomes assessed: H6, H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Substitutes correctly to determine time</li></ul>	3
<ul style="list-style-type: none"><li>• Attempts any TWO of the following<ul style="list-style-type: none"><li>– Substitutes correctly to determine acceleration</li><li>– Substitutes correctly to determine horizontal component of velocity</li><li>– Chooses the correct formula and attempts to find time</li></ul></li></ul>	2
<ul style="list-style-type: none"><li>• Chooses ONE correct formula only and attempts to find the acceleration OR</li><li>• Chooses ONE correct formula only and attempts to find the horizontal component of velocity OR</li><li>• Chooses ONE correct formula only and attempts to find time</li></ul>	1

**Question 20**
*Outcomes assessed: H7, H13*
**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Identifies <b>THREE</b> appliances</li> <li>• Identifies correctly the <b>THREE</b> different energy transfers/transformations</li> <li>• Identifies a use for each appliance</li> <li>• Uses an appropriate table to display information</li> </ul>	4
<ul style="list-style-type: none"> <li>• Provides <b>THREE</b> of the following:                             <ul style="list-style-type: none"> <li>– Identifies <b>THREE</b> appliances</li> <li>– Identifies correctly the <b>THREE</b> different energy transfers/transformations</li> <li>– Identifies a use for each appliance</li> <li>– Uses an appropriate table to display information</li> </ul> </li> </ul> OR <ul style="list-style-type: none"> <li>• Completes the table for two appliances</li> </ul>	3
<ul style="list-style-type: none"> <li>• Provides <b>TWO</b> of the following:                             <ul style="list-style-type: none"> <li>– Identifies <b>THREE</b> appliances</li> <li>– Identifies <b>THREE</b> energy transfers/transformations with <b>different</b> energy outputs correctly</li> <li>– Identifies a use for each appliance</li> <li>– Uses an appropriate table to display information</li> </ul> </li> </ul> OR <ul style="list-style-type: none"> <li>• Completes the table for one appliance</li> </ul>	2
<ul style="list-style-type: none"> <li>• Draws an appropriate table and correctly fills in some cells</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies an energy transformation for an appliance</li> </ul> OR <ul style="list-style-type: none"> <li>• Outlines the features of <b>THREE</b> appliances</li> </ul>	1

**Question 21 (a)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Identifies correct side of loop	1

**Question 21 (b)***Outcomes assessed: H9, H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Substitutes correctly to calculate torque	2
• Uses formula correctly, but makes an error in substitution	1

**Question 21 (c)***Outcomes assessed: H9, H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Manipulates equations to calculate the value of magnetic field strength	3
Equates two appropriate equations, AND EITHER • Makes an error in rearranging the equations OR • Makes an error in substitution	2
• Identifies an appropriate equation • Attempts to calculate magnetic field strength	1

**Question 22***Outcomes assessed: H4, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Demonstrates a sound knowledge of the development of the transistor as a replacement for thermionic devices</li><li>• Describes the advantages of using solid state devices over thermionic devices</li><li>• Identifies ways in which communication has been transformed in Australia</li><li>• Demonstrates coherence and logical progression within the answer</li></ul>	4
<ul style="list-style-type: none"><li>• Identifies ways in which communication has been transformed in Australia</li><li>• Demonstrates some knowledge about the development of solid state devices</li></ul> OR <ul style="list-style-type: none"><li>• States some of the advantages of using solid state devices over thermionic devices</li></ul>	2–3
<ul style="list-style-type: none"><li>• Lists some advantages of solid state devices over thermionic devices</li></ul> OR <ul style="list-style-type: none"><li>• States what a transistor does in a circuit</li></ul> OR <ul style="list-style-type: none"><li>• Lists some communication devices which use transistors or integrated circuits</li></ul>	1



**Question 23 (a)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Identifies correct direction	1

**Question 23 (b)***Outcomes assessed: H9, H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Substitutes correctly to calculate current	2
• Identifies the formula correctly but makes an error in substitution	1

**Question 23 (c)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Identifies the force on $W_2$ due to $W_1$ and $W_3$ relating the magnitude and direction of each force to distance and current • Describes the resultant force on $W_2$	3
• Identifies the force on $W_2$ due to $W_1$ and $W_3$ relating the magnitude of each force to distance and current	2
• Describes the force on $W_2$ due to $W_1$ and $W_3$	1

**Question 24 (a)***Outcomes assessed: H9, H12, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Correctly identifies the most flexible rubber band</li><li>• Provides a valid reason why that rubber band is most flexible</li></ul>	2
<ul style="list-style-type: none"><li>• Correctly identifies the most flexible rubber band</li></ul>	1

**Question 24 (b)***Outcomes assessed: H12, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Correctly identifies the strongest band</li><li>• Correctly identifies the region in which extension is directly proportional to the attached mass</li></ul>	2
<ul style="list-style-type: none"><li>• Correctly identifies the strongest band</li></ul> <p>OR</p> <ul style="list-style-type: none"><li>• Correctly identifies the region in which extension is directly proportional to the attached mass</li></ul>	1

**Question 25 (a)***Outcomes assessed: H9, H10, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Correctly identifies the type of charge and qualitatively states its magnitude</li></ul>	2
<ul style="list-style-type: none"><li>• Correctly identifies the type of charge</li></ul> OR <ul style="list-style-type: none"><li>• Qualitatively states the magnitude of the charge</li></ul>	1

**Question 25 (b)***Outcomes assessed: H9, H10, H12, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Substitutes correctly to determine the magnetic field strength</li></ul>	3
<ul style="list-style-type: none"><li>• Equates two appropriate equations</li><li>• Makes an error in rearranging the equations</li></ul>	2
<ul style="list-style-type: none"><li>• Chooses one correct formula only and attempts to find the magnetic field strength</li></ul>	1

**Question 26**
*Outcomes assessed: H7, H9, H14*
**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a thorough knowledge of how energy losses occur in transmission</li> <li>• Describes present techniques to reduce energy losses and relates to energy losses in transmission</li> <li>• Identifies a new technology to reduce energy loss and relates to how this technology could minimise energy losses in a source</li> <li>• Demonstrates coherence and logical progression</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge of how energy losses occur in transmission</li> <li>• Describes present techniques to reduce energy losses</li> <li>• Identifies a new technology to reduce energy loss and provides a feature of this technology</li> <li>• Communicates some scientific principles and ideas in a clear manner</li> </ul>	4–5
<ul style="list-style-type: none"> <li>• Demonstrates a knowledge of how energy is lost in transmission and identifies a new technology to reduce the losses</li> <li>• Communicates ideas in a basic form using general scientific terms</li> </ul> OR <ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge about how energy is lost in transmission and states how such loss is minimised</li> <li>• Communicates ideas in a basic form using general scientific terms</li> </ul>	2–3
<ul style="list-style-type: none"> <li>• Communicates simple ideas</li> </ul> AND EITHER <ul style="list-style-type: none"> <li>• States how energy is lost through a source</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies a new technology to reduce energy losses</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies how an energy loss is presently minimised</li> </ul> OR <ul style="list-style-type: none"> <li>• Identifies two sources of energy loss</li> </ul>	1

**Question 27 (a)**

*Outcomes assessed: H7, H10, H12, H13*

**MARKING GUIDELINES**

Criteria	Marks
• Substitutes correctly to calculate the frequency	2
• Uses formula correctly but makes an error in substitution OR • Makes an error in rearranging the equation	1

**Question 27 (b)**

*Outcomes assessed: H7, H10, H14*

**MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies the effect	1

**Question 27 (c)**

*Outcomes assessed: H7, H10*

**MARKING GUIDELINES**

Criteria	Marks
• Describes the photoelectric effect • Relates the description of the photoelectric effect and movement of charge at a $p$ - $n$ junction to the operation of a solar cell • Describes the flow of charge in $p$ and $n$ type semiconductors	4
• Describes the photoelectric effect AND/OR • Describes the flow of charge in $p$ and $n$ type semiconductors	2-3
• Outlines the photoelectric effect OR • Outlines the structure of $p$ and $n$ type semiconductors	1

## Section II

### Question 28 (a) (i)

*Outcomes assessed: H10, H11*

#### MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"><li>• Uses labels and text to demonstrate relevant features</li><li>• Draws a diagram of a valid experimental set up</li></ul>	2
<ul style="list-style-type: none"><li>• Draws a diagram of a valid experimental set up</li></ul>	1

### Question 28 (a) (ii)

*Outcomes assessed: H10*

#### MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"><li>• Uses results to demonstrate relationship</li><li>• Outlines results</li></ul>	2
<ul style="list-style-type: none"><li>• States results</li></ul>	1

### Question 28 (a) (iii)

*Outcomes assessed: H10*

#### MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"><li>• Outlines how radiation can be used for remote sensing using one specific example</li></ul>	2
<ul style="list-style-type: none"><li>• States an example of using radiation for remote sensing</li></ul>	1

**Question 28 (b) (i)***Outcomes assessed: H9, H12, H14***MARKING GUIDELINES**

Criteria	Marks
• Substitutes correctly to calculate $g$	2
• Uses formula correctly but makes an error in substitution	1

**Question 28 (b) (ii)***Outcomes assessed: H9, H12, H14***MARKING GUIDELINES**

Criteria	Marks
• Substitutes correctly to calculate radius of Earth	2
• Uses formula correctly but makes an error in substitution	1

**Question 28 (b) (iii)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

Criteria	Marks
• Relates to geophysical situation • Relate the features affecting period to the measured value • Identifies features affecting the period	3
• Outlines features affecting the period • Outlines geophysical situation	2
• States a relevant and correct geophysical feature OR • States one feature affecting period	1

**Question 28 (c) (i)***Outcomes assessed: H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Outlines features on graph relating to S and P waves</li><li>• Relates features on graph to delay between S and P waves</li><li>• Outlines how the delay can be used to deduce the location of the epicentre</li></ul>	3
<ul style="list-style-type: none"><li>• Outlines features about S and P waves</li><li>• Indicates how to deduce location of epicentre</li></ul>	2
<ul style="list-style-type: none"><li>• States correct information about S and P waves with reference to graph</li></ul>	1

**Question 28 (c) (ii)***Outcomes assessed: H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Provides features of seismic methods</li><li>• Relates features to search for oil and gas</li></ul>	2–3
<ul style="list-style-type: none"><li>• Outlines seismic methods</li></ul>	1



**Question 28 (d)**

*Outcomes assessed: H13, H14*

**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a thorough knowledge of geophysical techniques and dynamic nature of Earth</li> <li>• Describes THREE geophysical techniques</li> <li>• Relates each geophysical technique to theories supporting the changing nature of Earth</li> <li>• Use evidence and examples as appropriate</li> <li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge of geophysical techniques</li> <li>• Outlines TWO geophysical techniques and relates each to theories supporting the changing nature of Earth</li> <li>• Uses some evidence or examples</li> <li>• Communicates some scientific principles and ideas in a clear manner</li> </ul>	4–5
<ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge of geophysical techniques</li> <li>• Communicates ideas in a basic form</li> <li>• Outlines a geophysical technique and attempts to relate to the changing nature of Earth</li> </ul>	2–3
<ul style="list-style-type: none"> <li>• Outlines changing nature of Earth</li> <li>• Communicates simple ideas</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Identifies a geophysical technique</li> <li>• Communicates simple ideas</li> </ul>	1

**Question 29 (a) (i)***Outcomes assessed: H10***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Identifies the need for a material with higher absorption</li><li>Relates the higher absorption of x-rays to contrast</li></ul>	2
<ul style="list-style-type: none"><li>Identifies the need for a material with higher absorption</li></ul> OR <ul style="list-style-type: none"><li>Relates the higher absorption of x-rays to contrast</li></ul>	1

**Question 29 (a) (ii)***Outcomes assessed: H10, H13***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Provides a valid and clearly labelled diagram</li><li>Uses explicit text to describe what happens in the tube and the atomic processes</li></ul>	4
<ul style="list-style-type: none"><li>Provides a simple but valid diagram with some labels and text referring to what happens in the tube and/or atomic physics</li></ul> OR <ul style="list-style-type: none"><li>Uses explicit text to describe what happens in the tube and the atomic processes</li></ul>	2-3
<ul style="list-style-type: none"><li>Provides a labelled diagram of an x-ray tube</li></ul> OR <ul style="list-style-type: none"><li>Uses some text to describe either the processes in the tube or the atomic physics</li></ul>	1

**Question 29 (b) (i)***Outcomes assessed: H8, H12, H13***MARKING GUIDELINES**

Criteria	Marks
• Correctly calculates the acoustic impedance of blood	1

**Question 29 (b) (ii)***Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
• Correctly states the effect on the incident pulse	1

**Question 29 (b) (iii)***Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"><li>• Provides a description of a piezoelectric crystal</li><li>• Relates changes in the crystal to the production of ultrasound waves</li><li>• Relates ultrasound waves to the production of an electric potential</li></ul>	4
<ul style="list-style-type: none"><li>• Outlines a piezoelectric crystal</li><li>• Relates changing electric potential to the production of ultrasound</li><li>• Relates ultrasound waves to distortion of the piezoelectric crystal</li></ul>	2-3
<ul style="list-style-type: none"><li>• Outlines a piezoelectric crystal</li></ul> OR <ul style="list-style-type: none"><li>• Relates changing electric potential to the production of ultrasound waves</li></ul> OR <ul style="list-style-type: none"><li>• Relates ultrasound waves to the distortion of the piezoelectric crystal</li></ul>	1

**Question 29 (c) (i)***Outcomes assessed: H10***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Provides detailed arguments for or against the use of CAT scans including explicit examples of its use</li></ul>	4
<ul style="list-style-type: none"><li>Outlines some points for or against the use/properties of CAT scans</li></ul>	2–3
<ul style="list-style-type: none"><li>Identifies ONE advantage of using a CAT scan</li></ul> OR <ul style="list-style-type: none"><li>Identifies ONE disadvantage of using a CAT scan</li></ul> OR <ul style="list-style-type: none"><li>States ONE use/property of a CAT scan</li></ul>	1

**Question 29 (c) (ii)***Outcomes assessed: H10, H12***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Relates the use of a tracer to accumulation in the target organs</li><li>Provides a description of electron-positron annihilation to produce gamma rays</li><li>Provides a description of how gamma rays are detected</li></ul>	3
<ul style="list-style-type: none"><li>Provides TWO of the following:<ul style="list-style-type: none"><li>Outlines the role of the tracer</li><li>Provides an outline of positron emission and the production of gamma rays</li><li>Provides an outline of the detection of the gamma rays</li></ul></li></ul>	2
<ul style="list-style-type: none"><li>Provides ONE piece of relevant information</li></ul>	1

**Question 29 (d)***Outcomes assessed: H8, H9, H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Demonstrates thorough knowledge and understanding of producing an MRI image</li><li>• Provides a detailed sequence of events involved with specific reference to the physics involved</li><li>• Demonstrates coherence and logical progression and includes correct use of scientific terms</li></ul>	5–6
<ul style="list-style-type: none"><li>• Demonstrates sound knowledge and understanding of producing an MRI image</li><li>• Communicates some scientific principles and ideas in a clear manner</li></ul> <b>AND EITHER</b> <ul style="list-style-type: none"><li>• Provides a detailed sequence of events with some reference to the physics involved</li></ul> <b>OR</b> <ul style="list-style-type: none"><li>• Provides a simple sequence of events and demonstrates sound knowledge of the physics involved in these</li></ul>	3–4
<ul style="list-style-type: none"><li>• Demonstrates a basic knowledge of MRI images</li><li>• Communicates simple ideas</li></ul> <b>AND EITHER</b> <ul style="list-style-type: none"><li>• Provides a simple sequence of events with no reference to the physics involved</li></ul> <b>OR</b> <ul style="list-style-type: none"><li>• Provides one to two steps with some physics involved</li></ul>	1–2

**Question 30 (a) (i)***Outcomes assessed: H10***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Clearly notes the differences between resolution and sensitivity</li></ul>	2
<ul style="list-style-type: none"><li>Identifies resolution or sensitivity</li></ul>	1

**Question 30 (a) (ii)***Outcomes assessed: H8, H10***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Describes both active optics and interferometry</li><li>Identifies how interferometry improves resolution and sensitivity</li><li>Identifies reason why active optics are not useful</li></ul>	4
<ul style="list-style-type: none"><li>Does above but OMITTS</li><li>Description of active optics</li></ul> OR <ul style="list-style-type: none"><li>How interferometry improves resolution and sensitivity</li></ul> OR <ul style="list-style-type: none"><li>Does not identify why active optics is not useful</li></ul>	3
<ul style="list-style-type: none"><li>Omits 2 of the above</li></ul>	2
<ul style="list-style-type: none"><li>Only describes active optics or interferometry</li></ul> OR <ul style="list-style-type: none"><li>States how interferometry improves resolution and sensitivity</li></ul> OR <ul style="list-style-type: none"><li>Identifies reason why active optics is not useful</li></ul>	1

**Question 30 (b) (i)***Outcomes assessed: H8, H10***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Provides features of what is modelled with the computer simulation</li><li>Relates the light curve to the model</li></ul>	2
<ul style="list-style-type: none"><li>Describes a light curve</li></ul> OR <ul style="list-style-type: none"><li>Describes the binary star being modelled</li></ul>	1

**Question 30 (b) (ii)***Outcomes assessed: H12, H13***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Substitutes correctly to calculate the combined mass of the stars</li></ul>	2
<ul style="list-style-type: none"><li>Identifies the formula correctly but makes an error in substitution</li></ul>	1

**Question 30 (b) (iii)***Outcomes assessed: H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>Correctly identifies TWO differences and gives reasons for the differences</li></ul>	3
<ul style="list-style-type: none"><li>Correctly identifies TWO differences and gives one reason for the differences</li></ul>	2
<ul style="list-style-type: none"><li>Identifies TWO differences</li></ul> OR <ul style="list-style-type: none"><li>Describes the reasons for the differences</li></ul>	1

**Question 30 (c) (i)***Outcomes assessed: H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Identifies star colour correctly	1

**Question 30 (c) (ii)***Outcomes assessed: H13, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Describes how B and V are measured and relates them to colour index	2
• Describes how the magnitude of a star can be measured OR • States how B OR V are measured	1

**Question 30 (d)***Outcomes assessed: H2***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Describes advantages of photoelectric technologies	3
• Identifies advantages • Identifies photoelectric technologies and photographic methods OR • Describes advantages	2
• Identifies an advantage	1



**Question 30 (e)**
*Outcomes assessed: H14*
**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a thorough knowledge and understanding of the evolutionary path of the star</li> <li>• Provides a detailed sequence of events</li> <li>• Demonstrates thorough knowledge of the physical processes</li> <li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	5–6
<ul style="list-style-type: none"> <li>• Demonstrates a sound knowledge and understanding of the evolutionary path of the star</li> <li>• Communicates some scientific principles and ideas in a clear manner</li> <li>• Provides detailed sequence of events with some reference to the physical process</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Provides a simple sequence of events and demonstrates sound knowledge of the physical processes involved in these</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates a basic knowledge of the evolutionary path of a star</li> <li>• Communicates simple ideas</li> <li>• Provides simple sequence of events with no reference to the physical processes involved</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Provides one to two steps with some physical processes involved</li> </ul>	1–2

**Question 31 (a) (i)***Outcomes assessed: H2***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Outlines TWO features of Rutherford's model that explain the experimental results	2
• Outlines ONE feature of Rutherford's model that explains the experimental results	1

**Question 31 (a) (ii)***Outcomes assessed: H10***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
• Describes TWO problems associated with Rutherford's model of the atom • Relates how Bohr's model of the atom was able to deal with the problems associated with Rutherford's model	4
• Describes ONE or TWO problems associated with Rutherford's model of the atom • Relates how Bohr's model of the atom was able to deal with ONE problem associated with Rutherford's model	2-3
• Describes a problem associated with Rutherford's model of the atom OR • Outline Bohr's model of the atom	1

**Question 31 (b) (i)***Outcomes assessed: H8, H10***MARKING GUIDELINES**

Criteria	Marks
• Provides features and characteristics of de Broglie's concept of matter waves	2
• Identifies ONE feature of de Broglie's proposal	1

**Question 31 (b) (ii)***Outcomes assessed: H8, H10***MARKING GUIDELINES**

Criteria	Marks
• Outlines the experimental procedure carried out by Davidson and Germer • Identifies that electrons showed diffraction during the experiments • Relates the display of diffraction to a wave-like property	3
• Outlines the experimental procedure carried out by Davidson and Germer • Identifies that electrons showed diffraction during the experiments OR • Relates the display of diffraction to a wave-like property	2
• Outlines the experimental procedure carried out by Davidson and Germer OR • Identifies that electrons showed diffraction during experiments OR • Relates the display of diffraction to a wave-like property	1

**Question 31 (b) (iii)***Outcomes assessed: H8, H10, H12***MARKING GUIDELINES**

Criteria	Marks
• Substitutes correctly to calculate velocity	2
• Uses formula correctly but makes an error in substitution	1

**Question 31 (c) (i)**

*Outcomes assessed: H7, H8, H10, H12, H14*

**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>Correctly defines the term mass defect</li> </ul>	1

**Question 31 (c) (ii)**

*Outcomes assessed: H8, H10, H12, H14*

**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>Identifies that the binding energy of the nucleus with <math>A=200</math> is less than the binding energy of nucleus with <math>A=50</math></li> <li>Indicates the relationship between binding energy and stability of a nucleus</li> </ul>	2
<ul style="list-style-type: none"> <li>Identifies that the binding energy of the nucleus with <math>A=200</math> is less than the binding energy of nucleus with <math>A=50</math></li> </ul> OR <ul style="list-style-type: none"> <li>Indicates the relationship between binding energy and stability of a nucleus</li> </ul>	1

**Question 31 (d)**

*Outcomes assessed: H8, H10*

**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes Chadwick's experimental observations which lead him to conclude that an additional particle/radiation was emitted</li> <li>Relates how Chadwick used the laws of observation of momentum and kinetic energy to deduce the particle nature of the neutron</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines Chadwick's experimental observations which lead him to conclude that an additional particle/radiation was emitted</li> <li>Relates how Chadwick used the laws of observation of momentum and kinetic energy to deduce the particle nature of the neutron</li> </ul>	2
<ul style="list-style-type: none"> <li>Outlines Chadwick's experiments concerning the existence of an additional particle within the nucleus</li> </ul> OR <ul style="list-style-type: none"> <li>States one property of a neutron</li> </ul>	1

**Question 31 (e)***Outcomes assessed: H1, H8, H10, H14***MARKING GUIDELINES**

<b>Criteria</b>	<b>Marks</b>
<ul style="list-style-type: none"><li>• Demonstrates thorough knowledge and understanding of the standard model of matter</li><li>• Describes a theory or experiment that generated a new question or supported a postulate or prediction</li><li>• Relates contribution of the standard model to our understanding of matter</li><li>• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li></ul>	5–6
<ul style="list-style-type: none"><li>• Demonstrates sound knowledge and understanding of the standard model of matter</li><li>• Outlines how the standard model contributes to our understanding of matter</li><li>• Communicates some scientific principles and ideas in a clear manner</li></ul>	3–4
<ul style="list-style-type: none"><li>• Communicates ideas in a basic form using general scientific terms</li></ul> AND <ul style="list-style-type: none"><li>• Describe how theories and/or experiments have lead to an increased understanding of matter</li></ul> OR <ul style="list-style-type: none"><li>• Demonstrates a basic knowledge of the standard model of matter</li></ul>	1–2

**Question 32 (a) (i)***Outcomes assessed: H13, H14***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies Section A	1

**Question 32 (a) (ii)***Outcomes assessed: H12, H13***MARKING GUIDELINES**

Criteria	Marks
• Correctly calculates the potential $V_t$	1

**Question 32 (a) (iii)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies open loop configuration • Justifies that no feedback mechanism is present in the amplifier circuit	2
• Correctly identifies open loop configuration OR • Correctly observes that no feedback is used in the amplifier circuit	1

**Question 32 (a) (iv)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

Criteria	Marks
• Draws correctly structured truth table • Correctly completes at least 3 terms	2
• Draws correctly structured truth table OR • Draws a badly structured truth table and gets at least 2 terms of this table correct	1

**Question 32 (b) (i)***Outcomes assessed: H9, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"><li>• Correctly identifies the function of a transducer</li><li>• Shows similarities or differences of the input/output nature of each</li></ul>	2
<ul style="list-style-type: none"><li>• Makes a correct statement about the function of transducers</li></ul>	1

**Question 32 (b) (ii)***Outcomes assessed: H7***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"><li>• Correctly identifies all three transducers, their type and operation</li></ul>	5
<ul style="list-style-type: none"><li>• Correctly identifies all three transducers</li><li>• Correctly outlines the operation of at least one</li></ul>	3-4
<ul style="list-style-type: none"><li>• Correctly identifies at least two transducers and their type</li><li>• Correctly outlines the operation of at least one</li></ul>	2
<ul style="list-style-type: none"><li>• Correctly identifies at least one transducer and its type</li></ul>	1

**Question 32 (c)***Outcomes assessed: H7***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"><li>• Correctly differentiates between analogue and digital signals</li><li>• Correctly identifies the use of analogue and digital signals in a CD player</li></ul>	2
<ul style="list-style-type: none"><li>• Makes a correct statement about the characteristics of analogue or digital signals</li></ul> <p>OR</p> <ul style="list-style-type: none"><li>• Makes a correct statement about analogue or digital signals in a CD player</li></ul>	1

**Question 32 (d)**
*Outcomes assessed: H4*
**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>Identifies features of IC relevant to energy consumption</li> <li>Relates IC to energy consumption</li> <li>Draws out implications</li> </ul>	3-4
<ul style="list-style-type: none"> <li>Identifies features of IC relevant to energy consumption</li> </ul> OR <ul style="list-style-type: none"> <li>Identifies implications</li> </ul>	1-2

**Question 32 (e)**
*Outcomes assessed: H3, H14*
**MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none"> <li>Demonstrates a thorough knowledge and understanding of integrated circuits</li> <li>Provides a detailed description of advancements in silicon-based IC</li> <li>Relates above to miniaturisation</li> <li>Relates both of above to physics limitations (analogue and digital)</li> <li>Discusses current society and what will, and will not change, if reconceptualisation is not realised</li> <li>Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas</li> </ul>	5-6
<ul style="list-style-type: none"> <li>Demonstrates a sound knowledge and understanding of integrated circuits</li> <li>Provides a description of advancements in silicon-based IC and relates to miniaturisation and physics limitations</li> <li>Discusses above with some reference to current society and reconceptualisation</li> <li>Communicates some scientific principles and ideas in a clear manner</li> </ul>	3-4
<ul style="list-style-type: none"> <li>Demonstrates a basic knowledge of integrated circuits</li> <li>Communicates simple ideas</li> </ul> AND EITHER <ul style="list-style-type: none"> <li>Provides an outline at advances in IC</li> </ul> OR <ul style="list-style-type: none"> <li>Attempts to relate in a valid manner, to reconceptualisation and current society</li> </ul>	1-2



# Physics

## 2009 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
<b>Section I</b>			
<b>Part A</b>			
1	1	9.2.3.2.1	H9
2	1	9.2.2.3.4, 14.1f, 12.4b	H9, H14, H12
3	1	9.2.1.2.3	H6, H7, H9
4	1	9.2.2.2.1	H6, H9, H14
5	1	9.2.3.2.3	H9
6	1	9.3.3.2.1	H9
7	1	9.3.2.2.7, 14.1d	H9, H14
8	1	9.4.1.2.5, 14.1d	H9, H14.d
9	1	9.3.4.2.2	H9
10	1	9.4.3.2.5, 9.4.3.3.2, 12e	H3, H12
11	1	9.3.1.2.3, 9.3.1.2.5, 13	H9, H13.e
12	1	9.4.3.2.7, 9.4.3.2.2, 14.1f	H9, H14
13	1	9.4.4.2.5	H9
14	1	9.4.4.2.5, 9.4.2.2.4, 9.4.2.3.2	H9
15	1	9.4.1.2.4, 9.4.1.2.6, 13.1e	H9, H13
<b>Section I</b>			
<b>Part B</b>			
16 (a)	1	9.2.1.3.3, 12.4b	H6, H9, H12
16 (b)	2	9.2.2.3.5, 9.2.3.3.2, 9.2.2.3.4, 12.4b	H6, H9, H12
17 (a)	2	9.2.4.3.2, 11.3a, 13.1a, 14.1f	H6, H11, H13, H14
17 (b)	3	9.2.4.2.4, 9.2.4.2.5, 14	H6, H14
18 (a)	2	9.2.4.3.5, 13.1d, 14.1f, 12.4b	H12, H13, H14
18 (b)	2	9.2.4.3.5, 9.2.2.3.1, 13.1d, 14.1f, 12.4b	H12, H13, H14
19 (a)	3	9.4.1.3.3, 9.2.2.3.1, 12.4b, 13.1d	H6, H9, H12, H13
19 (b)	3	9.2.2.3.2, 9.2.2.3.1, 12.4b, 13.1d, 14.1f, 14.3b	H6, H12, H13, H14
20	4	9.3.5.3.2, 9.3.1.3.5, 9.3.4.2.6, 13.1a	H7, H13
21 (a)	1	9.3.1.2.1, 14.1f	H9, H14
21 (b)	2	9.3.1.2.3, 12.4b, 13.1d, 14.1f	H9, H12, H13, H14
21 (c)	3	9.3.1.2.3, 9.3.1.3.3, 12.4b, 13.1d, 14.1f	H9, H12, H13, H14
22	4	9.4.3.3.2, 9.4.3.3.3., 13.1a, 14.3b	H4, H13, H14
23 (a)	1	9.3.1.2.2, 14.1d	H9, H14
23 (b)	2	9.3.1.3.1, 12.4b, 13.1d	H9, H12, H13, H14
23 (c)	3	9.3.1.2.2, 13.1, 14.1f, 14.1d,g	H9, H14
24 (a)	2	12.3c, 12.4c, 14.1a, 14.1d, 14.3e	H9, H12, H14
24 (b)	2	12.3c, 12.4e, 14.1a, 14.1d, 14.3e	H12, H14

Question	Marks	Content	Syllabus outcomes
25 (a)	2	9.4.1.2.3, 14.1d, 14.3c	H9, H10, H14
25 (b)	3	9.4.1.3.3, 9.2.2.3.4, 9.4.1.2.5, 12.4b, 13.1d, 14.1f	H9, H10, H12, H13, H14
26	6	9.3.5.3.2, 9.4.4.2.7, 9.4.4.3.5, 9.3.4.3.3, 14.3b	H7, H9, H14
27 (a)	2	9.4.2.2.6, 9.4.2.3.4, 12.4b	H7, H10, H12, H13
27 (b)	1	9.4.2.3.2, 9.4.2.2.4, 14.1d	H7, H10, H14
27 (c)	4	9.4.2.3.3	H7, H10
<b>Section II</b>			
<b>Question 28 — Geophysics</b>			
28 (a) (i)	2	9.5.2.3.1	H10, H11
28 (a) (ii)	2	9.5.2.2.1	H10
28 (a) (iii)	2	9.5.2.2.3	H10
28 (b) (i)	2	9.5.1.3.1, 12.4b, 14.1d	H9, H12, H14
28 (b) (ii)	2	9.5.2.3.3, 9.5.2.3.4, 9.2.3.3.2, 12.4b, 14.1d	H9, H12, H14
28 (b) (iii)	3	9.5.2.2.4, 14.1a,d	H9, H14
28 (c) (i)	3	9.5.3.3.2, 9.5.3.2.2, 13.1, 14.1	H13, H14
28 (c) (ii)	3	9.5.3.3.2, 9.5.3.2.7, 13.1, 14.1	H13, H14
28 (d)	6	9.5.4.1, 9.5.1.2.1, 9.5.3, 14.3b	H10, H14
<b>Section II</b>			
<b>Question 29 — Medical Physics</b>			
29 (a) (i)	2	9.6.2.3.1, 9.6.2.2.1	H10
29 (a) (ii)	4	9.6.2.2.1, 13.1e	H10, H13
29 (b) (i)	1	9.6.1.3.5	H8, H12, H13
29 (b) (ii)	1	9.6.1.2.6	H8
29 (b) (iii)	4	9.6.1.2.2	H8
29 (c) (i)	4	9.6.2.2.4, 9.6.2.2.3	H10
29 (c) (ii)	3	9.6.3.2.2., 9.6.3.2.3, 9.6.3.2.4, 12.3e	H10, H12
29 (d)	6	9.6.4.2.4, 9.6.4.2.5, 9.6.4.2.6, 9.6.4.3.3, 13.1a, 14.3b	H8, H9, H13, H14
<b>Section II</b>			
<b>Question 30 — Astrophysics</b>			
30 (a) (i)	2	9.7.1.2.3	H10
30 (a) (ii)	4	9.7.1.2.2, 9.7.1.2.4, 9.7.1.2.5, 9.7.1.2.3	H8, H10
30 (b) (i)	2	9.7.5.3.1	H8, H10
30 (b) (ii)	2	9.7.5.3.2, 12.4b	H12, H13
30 (b) (iii)	3	9.7.3.2.4, 9.7.3.2.5, 9.7.5.2.1	H14
30 (c) (i)	1	9.7.4.2.1, 9.7.4.2.4	H13, H14
30 (c) (ii)	2	9.7.4.2.4	H13, H14
30 (d)	3	9.7.4.2.5	H2
30 (e)	6	9.7.6.2.1, 9.7.6.2.3, 9.7.6.3.2, 14.3b	H14

Question	Marks	Content	Syllabus outcomes
<b>Section II</b>			
<b>Question 31 — From Quanta to Quarks</b>			
31 (a) (i)	2	9.8.1.2.1	H2
31 (a) (ii)	4	9.8.1.2.2	H10
31 (b) (i)	2	9.8.2.2.1	H8, H10
31 (b) (ii)	3	9.8.2.2.3	H8, H10
31 (b) (iii)	2	9.8.2.3.1, 12.4b	H8, H10, H12
31 (c) (i)	1	9.8.3.2.9	H7, H8, H10, H12, H14
31 (c) (ii)	2	9.8.3.2.8, 12.3c, 14.1a	H8, H10, H12, H14
31 (d)	3	9.8.3.2.2	H8, H10
31 (e)	6	9.8.4.2.5, 14.3b	H1, H8, H10, H14
<b>Section II</b>			
<b>Question 32 — The Age of Silicon</b>			
32 (a) (i)	1	9.9.2.2.4, 9.9.2.2.5	H13, H14
32 (a) (ii)	1	9.9.2.3.3, 12.4b	H12, H13
32 (a) (iii)	2	9.9.6.2.5, 9.9.6.3.5	H9, H14
32 (a) (iv)	2	9.9.5.2.1, 9.9.5.3.1	H9, H14
32 (b) (i)	2	9.9.3, 9.9.4	H9, H14
32 (b) (ii)	5	9.9.2.2.6, 9.9.3.2.2, 9.9.3.2.4, 9.9.3.3.1, 9.9.4.2.1, 9.9.4.3.1,	H7
32 (c)	2	9.9.2.3.1, 9.9.2.3.2, 9.9.2.2.3	H7
32 (d)	4	9.9.1.3.1, 9.9.1.2.2, 9.9.3.1, 9.4.3.2.8	H4
32 (e)	6	9.9.1.2.3, 9.9.1.3.1, 9.9.2.2.3, 9.9.2.3.2, 9.9.6.3.5, 9.9.7.2.1, 9.9.7.3.1, 14.3b	H3, H14