2012 HSC Notes from the Marking Centre – Physics

Contents

Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Physics. It contains comments on candidate responses to the 2012 Higher School Certificate examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

This document should be read along with the relevant syllabus, the 2012 Higher School Certificate examination, the marking guidelines and other support documents developed by the Board of Studies to assist in the teaching and learning of Physics.

General comments

Teachers and candidates should be aware that examiners may ask questions that address the syllabus outcomes in a manner that requires candidates to respond by integrating their knowledge, understanding and skills developed through studying the course and including the prescribed focus areas. It is important to understand that the Preliminary course is assumed knowledge for the HSC course.

Candidates need to be aware that the marks allocated to the question and the answer space (where this is provided on the examination paper) are guides to the length of the required response. A longer response will not in itself lead to higher marks. Writing far beyond the indicated space may reduce the time available for answering other questions.

Candidates need to be familiar with the Board's Glossary of Key Words, which contains some terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the key words from the glossary. Questions such as 'how?', 'why?' or 'to what extent?' may be asked, or verbs that are not included in the glossary may be used, such as 'design', 'translate' or 'list'.

Teachers and candidates are reminded that the mandatory skills content in Module 9.1 is examinable in both the core and option questions and that all objectives and outcomes, including the Prescribed Focus Areas, are integral to the Stage 6 Physics Course.

Candidates are required to attempt only one question in Section II, and are strongly advised to answer the option they have studied in class.

Section I

Part B

Question 21

a. In better responses, candidates gave a clear outline of a procedure that produced data to enable ‘g’ to be determined, the specific data collected and the analysis of that data. In weaker responses, candidates relied on technology to provide data without a clear understanding of the procedure.

b. In better responses, candidates indicated that a comparison to a reading from a reliable secondary source was required.

c. In most responses, candidates correctly identified repetition as the best way of increasing reliability.

d. In better responses, candidates indicated that a measure of spread of the data already collected was required, followed by a judgement as to whether that spread was acceptable.

Question 22

a. In better responses, candidates linked a change in flux to both the development of an EMF and a current in the closed circuit.

b. In better responses, candidates referred to forces resulting in specific changes in the balance readings. They also noted the use of the plural term (changes) in the question.

Question 23

In better responses, candidates considered the motion of both masses and related them to the different positions of the towers from which they were released.

Question 24

a. In better responses, candidates labelled the conduction and valence bands of the conductors, semiconductors and insulators and showed the relative energy gap between them.

b. In better responses, candidates recognised that the movement of electrons from the valence band left behind a ‘hole’, and the direction of motion of the electrons and the holes in relation to the electric field.

Question 25

In better responses, candidates used precise language so that terms like efficiency were placed in the context of energy loss. They also recognised the importance of transistors in the development of integrated circuits and linked this technology to the development of diverse applications, and stated how these have impacted on society at large.

Question 26

In the best responses, candidates supported their evaluation with calculations of the power loss in each of the designs.

Question 27

In better responses, candidates recognised that the point where the toy bird struck the building was not the apex of the trajectory. They derived equations from the horizontal and vertical components of the initial velocity and solved these simultaneous equations to calculate the magnitude of the initial velocity.

Question 28

a. In better responses, candidates outlined the experimental results/observations supporting the theory, rather than merely identifying an experiment, or an aspect or prediction of the theory.

b. In better responses, candidates described the requirement for results of experiments that confirmed theoretical predictions.

c. Most candidates made correct substitutions into the length contraction formula.

Question 29

In better responses, candidates clearly linked the characteristics of the input current in the voice coil to the frequency and volume of the sound produced.

In better diagrams, candidates labelled all relevant features, including the direction of the magnetic field of the permanent magnet.

Question 30

a. This question was generally well answered. However, a significant number of candidates were not specific in indicating the opposite nature of the charge on the particles.

b. In better responses, candidates indicated both the direction and uniform nature of the centripetal force applied by the magnetic field.

c. In better responses, candidates equated centripetal force to the magnetic force and used this to show the relationship between the radius, mass and charge of the particle in the field.

Section II

Question 31

a. In most responses, candidates identified one variable. The majority of candidates did not identify a second variable or relate either variable to the pendulum.

b. i. Few candidates successfully identified a changing variable. In better responses, candidates explicitly linked the variable to the effect it had on the Earth's magnetic field.

ii. Most candidates had difficulty in determining any inconsistencies in the model presented. Few candidates distinguished between geographic and magnetic poles.

c. i. Most candidates experienced difficulty in interpreting the data presented in the graph.

ii. A few candidates related features of the graph to Earth's structure. In many responses, candidates related velocity to depth but not density. In most responses, candidates referenced the major change in the trend shown in the graph.

d. i. In most responses, candidates successfully described features of the magnetic anomaly pattern. Few candidates, however, made a correct statement regarding sea floor spreading.

ii. In many responses, candidates successfully related evidence consistent with plate tectonic theory.

e. In better responses, candidates explained a range of remote sensing processes and the physical principles involved.

Question 32

a. i. In better responses, candidates identified the necessary advancement in computer technology for the development of CAT scanners.

ii. Candidates included the use of a table in better responses.

iii. In better responses, candidates clearly demonstrated the differences in the production of radiation for PET and CAT scans.

b. i. In better responses, candidates gave a clear response in a few sentences.

ii. In better responses, candidates succinctly outlined how superconductors and transistors are used in MRI.

c. In better responses, candidates named and clearly described the uses of a radioactive isotope. Some candidates confused Tc-99m as being used for PET or as a positron emitter.

d. In better responses, candidates described the structure and the function of the coherent fibre bundle and of the incoherent fibre bundle, and linked this with total internal reflection. Some drew diagrams to clarify their answer.

e. In better responses, candidates described multiple uses and limitations. In the best responses, candidates linked physics principles, such as those found in acoustic impedance or in the Doppler effect, to explain their answers.

Question 33

a. i. Most candidates identified an appropriate reason in their response.

ii. In better responses, candidates described a method of collecting data and included a comparison.

b. i. In better responses, candidates described two or more problems

ii. In most responses, candidates identified and described ways of improving the resolution.

c. i. In most responses, candidates produced a flow diagram that included at least half the number of the celestial objects listed.

ii. In most responses, candidates described at least two nuclear fusion processes. In better responses, candidates described three processes.

d. i. In better responses, candidates related distance to the apparent shift of a star against its background over a 6-month period and included a relevant diagram.

ii. Most candidates identified that the technique was limited to close stars. However, in better responses, candidates linked this to the small angles involved.

e. In better responses, candidates included calculations using the data as well as descriptions of the stars and the binary system.

Question 34

a. i. In better responses, candidates linked the change in the energy of the stationary states to the energy of the emitted photon.

ii. This part was well answered by most candidates. In weaker responses, candidates stated only one observation.

b. i. In better responses, candidates linked the requirement for an increasing number of neutrons with an uncontrolled nuclear chain reaction.

ii In most responses, candidates linked the relationship between mass and energy. In better responses, candidates correctly compared the masses of products and reactants.

c. In better responses, candidates linked the work of Louis de Broglie to matter waves and included a discussion of the properties of neutrons.

d. i. In better responses, candidates outlined the number and types of quarks present in protons and neutrons, and how the combinations of quarks determined their properties.

ii. In better responses, candidates identified that charged particles were accelerated, and collision products were analysed.

e. In better responses, candidates outlined relevant examples of conservation laws and related them to developments in atomic physics.

Question 35

a. i. In most responses, candidates correctly classified the circuit.

ii. Most candidates recognised the thermistor, while in better responses, candidates showed awareness of the resistor's function.

iii. In better responses, candidates deduced the general trend of the voltage with temperature.

iv. In better responses, candidates showed a meaningful link between input and output.

v. In better responses, candidates calculated the temperature for the operation of the circuit.

b. In better responses, candidates linked the utility and application of relays to their superiority over transistors in large circuits.

c. In better responses, candidates constructed all eight points of the truth table.

d. In better responses, candidates linked the increased understanding of the properties of materials to complex manufacturing techniques and provided examples.