



**EDUCATIONAL QUALITY AND
ASSESSMENT PROGRAMME**

Scoring Schedule 2018

**South Pacific
Form Seven
Certificate**

© Educational Quality and Assessment Programme, 2018

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STRAND 1: Demonstrate understanding, by explanation and solving problems, of the physical phenomena, concepts, principles and relationships involved in mechanics.

STRAND 1: MECHANICS

1.1: MOMENTUM

| Item # | Skill Band | Evidence | Student Response Level | | | | | |
|--------|------------|---|---|--|---|-------------------|------|------------------|
| | | | Unistructural | Multistructural | Relational | Extended Abstract | Weak | |
| 1.1a | 1 | B | Correct answer | | | | | Incorrect answer |
| 1.1b | 1 | B | Correct answer | | | | | Incorrect answer |
| 1.1c | 2 | $p = mv$ $= 15.6 \times 0.47$ $p = 7.33 \text{ kgms}^{-1}$ | Correct formula or correct step 1. | Correct answer, i.e. both steps are correct, can accommodate for a 'slip' in calculation. | | | | Incorrect answer |
| 1.1d | 2 | $F = \frac{\Delta p}{\Delta t}$ $= \frac{(47 \times 10^{-3})(80.47)}{4.5 \times 10^{-3}}$ $F = 840.46 \text{ N}$ | Correct formula or correct conversion of mass | Correct answer. Can accommodate 'slips' in calculation for correct substitution. <i>The force on the golf club head is equal and opposite to the force on the golf ball.</i> | | | | Incorrect answer |
| 1.1e | 3 | $p_{\text{initial}} = p_{\text{final}}$ $(300 \times \overline{20}) + (7000 \times \overline{10}) = (300 + 7000)v$ $\overline{6000} + \overline{70\ 000} = 7300v$ $\overline{64\ 000} = 7300v$ $v = 8.77 \text{ ms}^{-1}$ | Any expression of the Law of conservation of momentum | Getting the correct magnitude of the total initial momentum, i.e. 64 000 kgms ⁻¹ or 7300 which is an understanding of 'stick together' | Correct answer. This can accommodate 'slips' in basic calculations. | | | Incorrect answer |

1.2: CIRCULAR MOTION

| Item # | Skill Band | Evidence | Student Response Level | | | | | |
|--------|------------|--|---|--|------------|-------------------|------|------------------|
| | | | Unistructural | Multistructural | Relational | Extended Abstract | Weak | |
| 1.2a | 1 | $\theta = \frac{s}{r}$ | Correct answer or any arrangement of it. | | | | | Incorrect answer |
| 1.2b | 1 | Centrifugal force | Correct answer. | | | | | Incorrect answer |
| 1.2c | 1 | A | Correct answer. | | | | | Incorrect answer |
| 1.2d | 2 | $\omega = 2\pi f$ $= 2\pi(5.56 \times 10^{-6})$ $\omega = 3.49 \times 10^{-3} \text{rads}^{-1}$ OR $v = \frac{2\pi r}{T} = \frac{2\pi(79)}{1800} = 0.28 \text{ms}^{-1}$ $\omega = \frac{v}{r} = \frac{0.28}{79} = 3.49 \times 10^{-3} \text{rads}^{-1}$ OR $\omega = \frac{\theta}{t} = \frac{2\pi \text{rads}}{1800 \text{s}}$ $= 3.49 \times 10^{-3} \text{rads}^{-1}$ | Recognizes any two correct formulae OR Correct value for f OR Correct value for v OR Correct value for $r=79 \text{m}$ | Correct working and answer ignoring minor 'slips' in number handling | | | | Incorrect answer |

1.3: SIMPLE HARMONIC MOTION (SHM)

| | | | | | | | | |
|------|---|---|--|-------------------------------|--|--|--|------------------|
| 1.3a | 1 | D | Correct answer | | | | | Incorrect answer |
| 1.3b | 1 | D | Correct answer | | | | | Incorrect answer |
| 1.3c | 3 | $f = 300 \frac{\text{stitches}}{\text{minute}} \times \frac{1 \text{ minute}}{60 \text{ s}}$ $= \frac{5 \text{stitches}}{\text{s}}$ $f = 5 \text{Hz}$ $\omega = 2\pi f = 2\pi \times 5 = 31.42 \text{rads}^{-1}$ | Correct conversion to 5 stitches/s OR Identifying the correct formula in $\omega = 2\pi f$ | Equating 5 stitches/s to 5 Hz | Correct working and answer or incorrect final value due to slip in number operations, but correct process is followed. | | | Incorrect answer |

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| 1.3d | 2 | <p>Resonance is the process that causes high-amplitude vibrations to occur because the frequency of the driving force matches the natural frequency.</p> <p>For resonance to occur, Tom's pushes must have the same frequency as the natural frequency of the SHM. Also, they must be in the direction in which the bumble-bee is moving- because a force in the direction of motion causes the speed and hence the kinetic energy of the system to increase. A regular input of energy into the system causes the amplitude to increase, and so Tom's repeated pushes will cause the bumble bee's motion to develop a larger amplitude which demonstrates resonance.</p> | Defining resonance. One idea mentioned only. | <p>Full description provided.</p> <p>Multiple / few ideas present.</p> | | | Invalid conceptual understanding |
|------|---|---|--|--|--|--|----------------------------------|

STRAND 2: Demonstrate understanding, by explanation and solving problems, of the physical phenomena, concepts, principles and relationships involved in waves.

STRAND 2: WAVES

2.1: SOUND WAVE

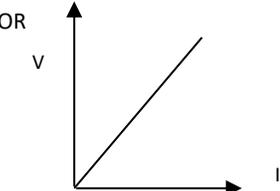
| Item # | Skill Band | Evidence | Student Response Level | | | | | |
|----------------------------|------------|---|---|---|------------|-------------------|------|------------------|
| | | | Unistructural | Multistructural | Relational | Extended Abstract | Weak | |
| 2.1a | 1 | Is the distance between two consecutive crests or two consecutive troughs. (can also be between two consecutive compressions and rarefactions). | Correct definition | | | | | Incorrect answer |
| 2.1b | 1 | $f = \frac{v}{\lambda} = \frac{325}{0.176} = 1850 \text{ Hz}$ | Correct answer | | | | | Incorrect answer |
| 2.1c | 1 | $T = \frac{1}{f} = \frac{1}{1850} = 5.41 \times 10^{-4} \text{ s}$ | Correct answer OR Consistency marking OR Correct substitution | | | | | Incorrect answer |
| 2.2: DOPPLER EFFECT | | | | | | | | |
| 2.2a | 2 | $f' = f \frac{v_m}{v_m - v_s} = \frac{20 \times 330}{330 - 50}$ $f' = 24 \text{ Hz}$ | Recognizes correct form of formula | Correct answer OR Incorrect final value but correct process followed | | | | Incorrect answer |

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|------|---|---|--|---|--|--|----------------------------------|
| 2.3a | 2 | Monochromatic light (light of one colour, one wavelength) was allowed to pass through two narrow slits. The slits are parallel to the light source and very close together. A series of bright and dark bands are seen on the screen placed a few metres from the narrow slits. | Mentions the use of monochromatic light (or light of one color) OR The correct diagram of the set-up | Mentions the use of double slits, a screen and formation of a series of dark and bright bands | | | Invalid conceptual understanding |
|------|---|---|--|---|--|--|----------------------------------|

| Item # | Skill Band | Evidence | Student Response level | | | | |
|--------|------------|--|---|---|--|--|----------------------------------|
| | | | Unistructural | Multistructural | Relational | Extended Abstract | Weak |
| 2.3b | 3 | $n\lambda = d\sin\theta$ $d = \frac{n\lambda}{\sin\theta} = \frac{(1)(575 \times 10^{-9})}{\sin 16.5^\circ}$ $d = 2.02 \times 10^{-6}m$ | Recognizes the value of n or correct formula | Correct conversion of 575 nm OR correct substitution of $\sin 16.5^\circ$ | Correct answer or incorrect final value due to slip in number operation, but correct process is followed | | Incorrect answer |
| 2.3c | 4 | <p>Green light has a shorter wavelength compared to red. Shorter wavelength causes fringes to be closer together.</p> $\lambda \propto x$ <p>If the screen was moved closer, L decreases which causes the fringes to be closer.</p> $L \propto x$ <p>If the distance between the slits was decreased, d decreases. When d decreases it will cause the pattern to spread out or scatter or diffract more.</p> $d \propto \frac{1}{x}$ | <p>Recognizes the correct formula</p> $n\lambda = \frac{dx}{L}$ <p>Or</p> <p>one correct effect</p> | <p>Two or more correct effects stated.</p> <p>Does not include its correct relation to the cause.</p> | Two – three correct effects, and states their correct relation to the causes. | <p>Two – three correct effects, and states their correct relation to the causes.</p> <p>Makes prediction, generalisation/engages in abstract thinking based on the effects and causes. . E.g. uses everyday examples to indicate extension of thinking</p> | Invalid conceptual understanding |

STRAND 3: ELECTRICITY AND ELECTROMAGNETISM

3.1 DC CIRCUITS AND CAPACITANCE

| Item # | Skill Band | Evidence | Student Response Level | | | | | |
|--------|------------|--|--|---|---|-------------------|------|----------------------------------|
| | | | Unistructural | Multistructural | Relational | Extended Abstract | Weak | |
| 3.1a | 1 | B | Correct answer | | | | | Incorrect answer |
| 3.1b | 1 | <p>The current through a conductor is directly proportional to the voltage across it provided the temperature of the conductor is constant.</p> <p>OR $V \propto I$ OR $V = IR$</p> <p>OR</p>  | <p>Correct statement</p> <p>OR expression/formula</p> <p>OR Graphical representation</p> <p>i.e. one correct idea is evident in the response</p> | | | | | Incorrect answer |
| 3.1c | 2 | $\frac{1}{C_{TOT}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \dots$ $\frac{1}{C_{TOT}} = \frac{1}{3} + \frac{1}{5} + \frac{1}{10} = \frac{19}{30}$ <p>$\therefore C_{TOT} = 1.58 \times 10^{-6} F$ or $1.58 \mu F$</p> | <p>Recognizes correct formula OR</p> <p>Makes correct substitution</p> | <p>Correct working and answer OR</p> <p>Incorrect final value due to slip in number operation, but correct process is followed</p> | | | | Incorrect working and answer |
| 3.1d | 3 | As the battery runs low (down), the internal resistance increases. This will increase the total resistance of the circuit and hence less current will flow. Also, the voltage across the internal resistance would increase (because its resistance is greater) and so the voltage across the lamp would decrease. The result will be less power ($P=VI$) dissipated by the lamp, so the light will be dimmer. | Any one idea present only. | <p>Mentions that internal resistance, r, of battery increases.</p> <p>Two or more ideas present, but the relationship between the ideas not mentioned.</p> | <p>Relates increase in r causes less I and decrease in V</p> <p>Two- three ideas present. Answer shows relationship between the ideas.</p> | | | Invalid conceptual understanding |

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| | | | | | Explains causes and reasons. | | |
| 3.2: TRANSFORMER | | | | | | | |
| | | Evidence | Unistructural | Multistructural | Relational | Extended Abstract | Weak |
| 3.2a | 2 | $\frac{V_P}{V_S} = \frac{N_P}{N_S}$ $V_P = \frac{N_P}{N_S} \times V_S = \frac{2420}{121} \times 12 = 240 V$ | Recognises correct formula, or makes the correct substitutions | Correct answer OR Incorrect final value due to slip in number operation, but correct process is followed. | | | Incorrect working |
| 3.2b | 2 | $P_S = V_S I_S$ $I_S = \frac{P_S}{V_S} = \frac{24}{12} = 2 A$ | Recognises correct formula | Correct answer | | | Incorrect working |
| 3.2c | 3 | An alternating voltage in the primary coil means there is changing current in the primary coil. Changing current in the primary coil induces a changing flux in the core of the coil, and the transformer's iron coil transmits this changing flux through the coil of the secondary coil. Changing flux in the secondary coil induces a changing voltage in the secondary coil, and this changing voltage makes a changing current flow through the light bulb. | Mentions V_P induces I_P . Any one idea present only. OR Mention of terms like "magnetic flux" and or "induces" | Mentions I_P induces V_S Two or more ideas present, but the relationship between the ideas not mentioned. | Two- three ideas present. Answer shows relationship between the ideas. Full explanation. | | Invalid conceptual understanding |
| 3.2d | 4 | Modern safety features are employed to prevent thermal and shock hazards. Modern household and industrial wiring requires the three-wire system which has several safety features: Circuit breakers and fuses prevent thermal overload thus interrupt excessive current. Protective case around the appliance prevents shock. A GFI (ground fault interrupter) is a safety device that works on electromagnetic induction. Live current must equal neutral current such that they induce equal and opposite emfs in the coil. GFI compares the live current and the neutral current. If the | Mentions one hazard of electricity. | Mentions two or more-wire system, circuit breakers (fuse), protective case. Or two or more ideas provided but not related or connected. | Explains how GFI works Two or more ideas provided and the relationship /connection between the ideas are given. Gives implications/effects of modern safety features in electric circuits. | Full explanation Explains how GFI works Two or more ideas provided and the relationship /connection between the ideas are given. Gives implications/effects of modern safety features in electric circuits. | Invalid conceptual understanding |

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| | | difference exceeds the safety limit, GFI interrupts the circuit and the circuit breaker trips. | | | | Answer includes ability to reach abstract thinking such as suggestions, advice and real life examples. | |
| 3.2e | 1 | Magnetism is caused by the motion of electric charges. | Correct answer | | | | Incorrect answer |
| 3.2f | 1 | A | Correct answer | | | | Incorrect answer |
| 3.2g | 1 | D | Correct answer | | | | Incorrect answer |

STRAND 4: Demonstrate understanding, by explanation and solving problems, of the physical phenomena, concepts, principles and relationships involved in atomic and nuclear physics.

STRAND 4: ATOMIC AND NUCLEAR PHYSICS

RADIOACTIVITY

| Item # | Skill Band | Evidence | Student Response Level | | | | | |
|--------|------------|---|--|--|---|-------------------|------|----------------------------------|
| | | | Unistructural | Multistructural | Relational | Extended Abstract | Weak | |
| 4.1a | 1 | Alpha radiation | Correct answer | | | | | Incorrect answer |
| 4.1b | 1 | It cannot be deviated by a magnetic field. Travels at the speed of light. Penetrates through paper, and a thin sheet of metal. Can be stopped by lead Highest penetrating power Transverse wave Weak ionizing power Highest energy Highest frequency Shortest wavelength | Any one from the list given. | | | | | Incorrect answer |
| 4.1c | 2 | Drawback <ul style="list-style-type: none"> It failed to explain why electrons could only have certain fixed energy levels It could not explain some smaller details of the spectrum (Zeeman Effect) It did not work very well for atoms with more than one electron Possible to predict the position of an electron which defies Heisenberg Uncertainty Principle | Attempts to describe a drawback with one relevant idea. | Describes any one of the drawbacks in detail, with two or more relevant ideas. | | | | Invalid conceptual understanding |
| 4.1d | 3 | $K.E = hf - \phi$ $= 3.11 - 2.46$ $= 0.65 \text{ eV}$ $K.E = 1.04 \times 10^{-19} \text{ J}$ | Recognizes the correct formula or makes the correct substitution | Gets answer in eV i.e. 0.65 eV | Correct working and correct answer OR Incorrect final value due to slip in number operation, but correct process is followed | | | Incorrect answer |

| | | | | | | | |
|------|---|--|----------------|--|--|---|----------------------------------|
| 4.1e | 4 | <p>Practical fusion energy generation requires the combining of two light atomic nuclei usually that of Deuterium and Tritium. Since these are isotopes of hydrogen, being both positively charged, great amount of energy is needed to overcome the repulsive forces. The collision is exothermic reaction and releases neutrons and electrons. Gas from Deuterium and Tritium is heated to a very high temperature (100 Million degree Celsius). This is achieved through magnetic confinement where the hot gas (plasma) is controlled in toroidal chambers magnetic coils.</p> | Defines fusion | <p>Defines fusion</p> <p>AND</p> <p>Mentions the raw materials and that they are easily obtainable</p> <p>i.e. provides two or more relevant ideas</p> | <p>Mention two or more problems:</p> <ul style="list-style-type: none"> ▪ high initial start-up temperature needed (100 Million °C) ▪ confining high temperature plasma so that it does not touch anything | Full explanation, with evidence of abstraction through examples of real life situations | Invalid conceptual understanding |
|------|---|--|----------------|--|--|---|----------------------------------|

THE END