Mark Scheme (Results)

Summer 2024

Pearson Edexcel GCE
Music Technology (9MT0)
Paper 04: Producing and Analysing

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

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Question Number	Answer	Mark
1(a)(i)	Varying volumes of drum hits (1) Musical expression (1) Human feel / natural / not mechanical (1) Accents (1) Dynamics (1) Ghost hits (1) Realistic (1)	1

Question Number	Answer	Mark
1(a)(ii)		2

Velocity in decimal	Velocity in binary
126 (1)	1111110 (1) Allow preceding 0s

Question Number	Answer	Mark
1(b)(i)	2 (1)	1

Question Number	Answer	Mark
1(b)(ii)	**C** 8192 **A** is incorrect because this is almost minimum deflection B is incorrect because this is almost minimum deflection **D** is incorrect because this it outside of the range of pitch bend	1

Question Number	Answer	Mark
1(b)(iii)	**D** `0111 1111 0111 1111` **A** is incorrect because this is 0 **B** is incorrect because this is 127 **C** is incorrect because this is 16256	1

Question Number	Answer	Mark
1(c)	1 mark for each correctly assigned drum sound that plays the correct rhythm, in sync throughout. Kick drum (1) Snare (1) Open hi-hat (1) Ride cymbal (bell), 16:4:1, 33:4:1, 56:4:1 (1) Rack tom (1) Floor tom (1) [award 1 mark for toms if the wrong way around] Crash cymbal (1) two crash cymbals are distinguishable, e.g. 52:1:1:1 & 54:1:1:1 are different from other crashes 52-55 (1) Max 5 if the kit is not acoustic. If a candidate has only submitted bars 32-35 then award 0 for all of question 1. Insufficient work has been submitted in q1 to assess. If the drums are not soloed, or metronome is switched on, then assess what can be heard clearly.	8

Question Number	Answer	Mark
2(a)	**B** The gate cuts all sound below the threshold **A** is incorrect because only sound below the threshold is cut **C** is incorrect because the threshold is in loudness domain, not frequency domain **D** is incorrect because the gate is applied to an audio track so velocity is irrelevant	1

Question Number	Answer	Mark
2(b)	**A** dB **B** is incorrect because Hz measures frequency **C** is incorrect because ms measures time **D** is incorrect because V measures Voltage	1

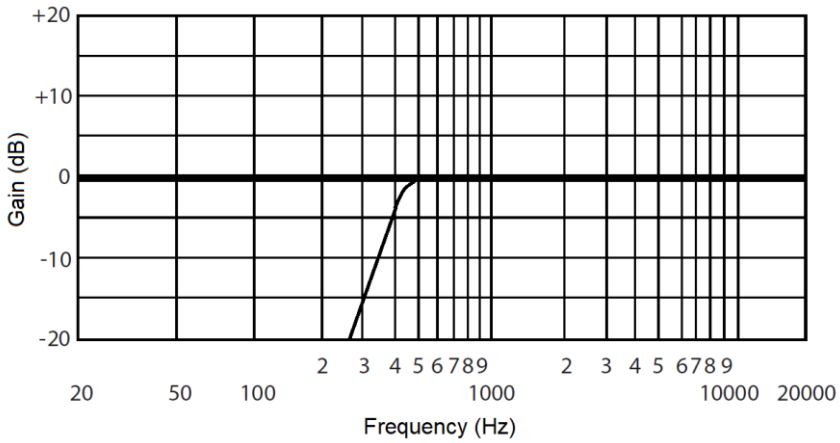
Question Number	Answer	Mark
2(c)	**C** ms **A** is incorrect because dB measures loudness **B** is incorrect because Hz measures frequency **D** is incorrect because V measures Voltage	1

Question Number	Answer	Mark
2(d)	High gain / distortion (1) <u>adds/increases</u> noise/hum (1) Noisy amps (1) Playing noise / fret noise (1) Create clean gaps between (muted) chords / cuts out noise <u>when not playing</u> (1) Stacking pedals (1) <u>adds/increases</u> noise/hum (1) Not “cuts out noise”	2

Question Number	Answer	Mark
2(e)	Bars 26-33 are copied from 18-25 (1) and are in time with no clicks/glitches/doubling at 26 and noise is removed from bar 9 (1) [if bar 9 missing then noise cannot be assessed][allow slight pick noise end of bar 9] Bars 34-57 are filled with the 8 bar phrase from 10-17 (1) and are in time with no clicks/glitches; [the glitch should be removed from the end of bar 57] (1). If the part is not soloed or the metronome is left on, then noise/clicks/glitches cannot be assessed; phrases can only be assessed if clearly audible.	4

Question Number	Answer	Mark
2(f)	**Pitch and rhythm**: Pitch has been changed in some way in bar 36-37 (1) 36:3:3 pitch and rhythm correct: E (1) 36:4:3 pitch and rhythm correct: F# (1) 44 pitch and rhythm correct / same as bar 36 (error carried forward) (1) **Sample editing (if notes have been retuned)**: No other pitch/rhythm errors introduced [check bars 12 & 52 also haven't changed] AND Retuned notes have: • matching timbre / no intrusive artefacts • no glitches/clicks • no volume change • no additional effects • correct timing (1) If the part is not soloed or the metronome is left on, then sample editing cannot be assessed; pitch and rhythm can only be assessed if clearly audible. Award 0 marks if candidate has used a MIDI timbre to play the corrected pitches.	5

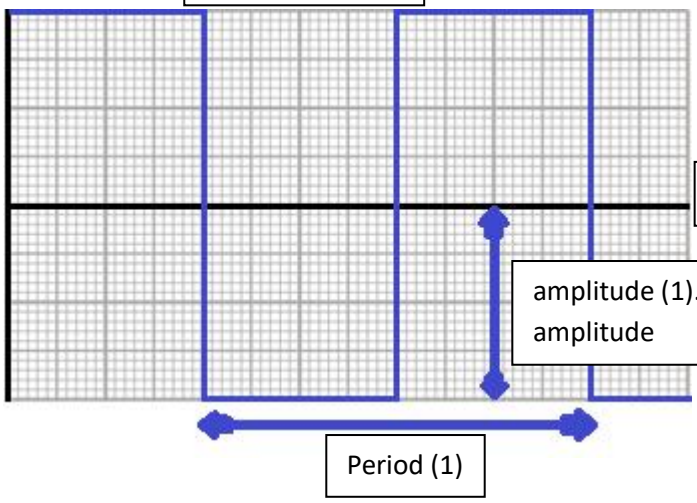
Question Number	Answer	Mark
3(a)(i)	Slope / steepness / gradient (1) allow “Q” For every octave, the output gain is reduced by 48dB / amount of reduction per octave (1) 48dB/octave is very steep (1)	2

Question Number	Answer	Mark
3(a)(ii)	**Curve:** HPF (1) **Slope:** HPF is steep, not vertical curve that is steeper than 45º AND hits -20 (1) [allow slight (5dB max) resonance] **Frequency:** HPF curve starts on x-axis 200Hz-1000Hz (1) Max 1 if any additional boosts or cuts.  	3

Question Number	Answer	Mark
3(b)(i)	20 (1) Ignore working out	1

Question Number	Answer	Mark
3(b)(ii)	60 (1) Ignore working out	1

Question Number	Answer	Mark
3(c)	**C** The RMS level of the distorted signal is higher than the original clean signal. **A** is incorrect because louder gains increase RMS level. **B** is incorrect because the RMS level is higher on the distorted signal. **D** is incorrect because the RMS level is higher on the distorted signal.	1

Question Number	Answer	Mark
4(a)	 Accept DC offsets.	5

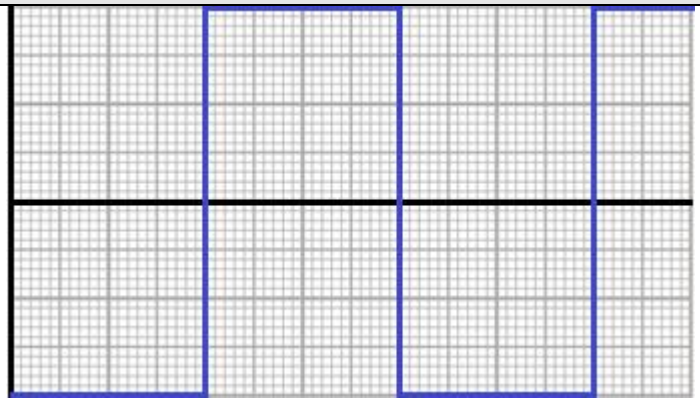
Waveshape (1)

Voltage / V / displacement (1)
Allow volume / level / amplitude / dB
Accept appropriate digital numbering: e.g. 0-65535

s / ms / time (1)

amplitude (1). Allow peak to peak amplitude

Period (1)

Question Number	Answer	Mark
4(b)	 Credit graph of the same waveform in (a) but in reversed polarity (1).	1

Question Number	Answer	Mark
4(c)	Silence / destructive interference / cancel out / cancellation (1)	1

Question Number	Answer	Mark
4(d)	Drums/drum kit (1) Multiple mics/stereo pair/overheads (1) used to record the same source (1) e.g. multi-mic'ing drum kit (2), snare top and bottom (2) multi-mic'ing guitar cabinet (2), multiple mics on different speaker cones (2) Mics facing different directions (1) Mics are different distances from sound source (1) Mid-side configuration (1) using a figure of 8 and a cardioid/omni (1) Combining a mic signal and DI signal (2)	2

Question Number	Answer	Mark
4(e)	Listen to vocal in bar 44.	4

Mark	Removal of noise from vocal track
4	The noise is quieter than or equal to MS "q4.wav". The singing is intact without any sections cut out or clicks. [Gain is 5.1dB so barely audible noise]
3	The noise is quieter than or equal to MS "q4.wav". The singing is intact but clicks/glitches present. OR The noise is quieter than candidate F [attempted gain matching]
2	The noise is equal to candidate F [no gain matching]
1	The noise is quieter than "vocal.wav" but louder than candidate F AND/OR The noise has been cut out in between the singing but the noise remains under the singing. AND/OR Intrusive gating/fading/EQ AND/OR There are audible timing errors AND/OR Wrong vocal phrase
0	No attempt at cutting out any noise OR Most of vocal removed in bar 44
Note: Ignore lip smack at 44:1. If vocal is not soloed or the metronome is switched on, assess what can be heard clearly up to max. 2.	

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>4(f)</td><td>
<table>
<tr><td>Cardioid (1)

Most sensitive at <u>0 degrees</u> (1)
Least sensitive at <u>180 degrees</u> (1)</td><td>Reduces spill/reverb/noise (1) [must relate to cardioid]

If vocalist goes off axis, will become quieter (1)</td></tr>
<tr><td>More directional with higher frequencies (1)</td><td>If vocalist goes off axis, will become duller (1)
Less <u>high frequency</u> spill/reverb/noise (1) [allow references to the given frequencies]</td></tr>
<tr><td>Polar response widens from 250Hz-1000Hz (1)
Polar response mostly uniform between 250-2500Hz (1)</td><td></td></tr>
<tr><td>2500Hz has the least rear rejection (1)</td><td></td></tr>
</table>
</td><td>4</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>4(g)</td><td>1 mark for each feature to a maximum of 4 (AO3). 1 mark for each analytic point (AO4).

Do not double credit repeats shown in italics.
<table>
<tr><th>AO3</th><th>AO4</th></tr>
<tr><td>Nearfield monitors</td><td></td></tr>
<tr><td>Two way (1)</td><td>Wider/flatter frequency response (1)</td></tr>
<tr><td>Woofer (1)
Larger cone (1)</td><td>Good for low frequencies/bass (1)</td></tr>
<tr><td>Tweeter (1)</td><td>Good for high frequencies/treble [needs to be linked to tweeter] (1)</td></tr>
<tr><td>Louder (1)</td><td>Can monitor at a variety of volumes (1)
Less distortion (1)
Better signal to noise ratio / dynamic range (1)
Can hear quiet detail in mix (1)</td></tr>
<tr><td>Stereo / panning (1)</td><td>Valid example of use of stereo, e.g. double tracked guitars, drum panning (1)</td></tr>
<tr><td>Mobile phone</td><td></td></tr>
<tr><td>Small speaker (1)</td><td>Narrower/uneven frequency response (1)
Bass/low frequencies wouldn’t be reproduced / descriptive word, e.g. tinny (1) below 100Hz-800Hz (1)
Distortion could be introduced (1)
Designed for human voice (1)
Test mix translation / check mix works on a mobile phone speaker (1)
Useful for checking balance (1)
Useful for checking for sibilance (1)
Phones apply additional processing to maximise poor speaker (1)</td></tr>
<tr><td>Mono (1)</td><td></td></tr>
<tr><td></td><td>When back of phone is attached sound is muffled / reduced HF (1)</td></tr>
</table></td><td>8</td></tr>
</table>

Question Number	Answer	Mark
5(a)	All noise/hum removed in bars 58-59 with no additional glitches (1). Allow slight pick noise on 58:1. Award 0 if all of bar 58 is removed. Award 0 if bar 58 is masked by other instruments.	1

Question Number	Answer	Mark
5(b)	Listen to the rhythm electric guitar in bars 2-9. HPF (1) HPF cut-off matches MS 'q5.wav' (1) HPF with no clicks or glitches (1) If there is not HPF then award 1 mark for any LPF/BPF/EQ in bars 2-9.	3

Question Number	Answer	Mark
5(c)		3

	Double tracking of rhythm guitar
3	Excellent double tracking effect which sounds like two separate hard panned rhythm guitar parts similar to "q5.wav" throughout (including bars 2-9).
2	A wide stereo modulation effect has been applied but it sounds like one processed guitar. OR Double tracking not present throughout
1	A narrow stereo effect or reverb has been applied but it sounds like one processed guitar. OR Guitar is double tracked in mono / phases intrusively / delay time too long / has delay feedback / moving panning.
0	There is no audible evidence of double tracking on the rhythm guitar. OR No mix present.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5(d)</td><td>
<table>
<tr><td></td><td>Management and control of the vocal dynamics
There are loud vocal peaks:
“out” in bar 20
“ground” in bar 24</td></tr>
<tr><td>2</td><td>All of the vocal is clearly audible and peaks are controlled.
Overall, the dynamic range is = MS ‘q5.wav’</td></tr>
<tr><td>1</td><td>The vocals have clearly audible compression > MS ‘q5 unmixed.wav’ and the dynamic range is reduced, however some parts of the vocal are partially masked/uneven level.
OR
Clearly audible volume automation.
OR
Obvious pumping.
OR
Transients not controlled.</td></tr>
<tr><td>0</td><td>No compression can be identified on the vocal.
OR
No mix present.</td></tr>
</table>

Award a further mark if:
Compression has been added to the vocal in 6-31
AND
the overall level is similar to the level in bars 34-53
AND
no additional compression is added to 34-53
AND
no additional compression is added to delay in 31 (1)
</td><td>2+1</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5(e)</td><td>
<table>
<tr><td></td><td>Lead guitar gating bars 34-49.</td></tr>
<tr><td>3</td><td>Keyed gate:
Lead guitar plays simultaneously with ‘gate tone.wav’</td></tr>
<tr><td>2</td><td>Keyed gate:
Lead guitar plays simultaneously with ‘gate tone.wav’
BUT
Glitches / not all bars gated, e.g. 49 not gated
OR
Attack/release too long</td></tr>
<tr><td>1</td><td>Keyed gate
BUT
Other bars are affected
OR
‘gate tone.wav’ is present
OR
Incorrect gate triggering/rhythm</td></tr>
<tr><td>0</td><td>There is no audible evidence of keyed gating on the lead guitar.
No mix present on CD.</td></tr>
<tr><td></td><td></td></tr>
</table>

Allow errors from Q2 if the wrong part of the guitar is playing in 34-49.</td><td>3</td></tr>
</table>

Question Number	Answer	Mark
5(f)	Listen to the delay in bar 7. Mono delay (1) minim delay time (1) Send amount ≈90%-100% and feedback≈64% AND no glitches/changes in volume/extra words (1) [should fill the gap before drums] Delay is filtered LPF/BPF (1) LPF and cutoff matches ‘MS q5.wav’ (1) Max 2 if delay is present throughout. Max 1 if delay affects other tracks.	5

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5(g)</td><td>Supplied audio:
bass loud -2dB peak (mastered loud as possible)
vocals quiet -8dB peak
lead guitar loud -2dB peak (mastered loud as possible)
rhythm guitar loud -2dB peak (mastered loud as possible)
drums are MIDI
<table>
<tr><th></th><th>Balance and blend</th></tr>
<tr><td>3</td><td>Balanced and blended across all parts of the mix. Vocals sit on top of mix and bass is similar to MS ‘q5.wav’</td></tr>
<tr><td>2</td><td>Most tracks are balanced with some masking. A few misjudgements, e.g. vocals under / lead guitar over</td></tr>
<tr><td>1</td><td>Balanced so that one track is barely audible. E.g. vocal <= MS ‘q5 unbalanced’.
OR
Not all of a track present affecting balance
OR
Additional tracks.
OR
Erratic volume changes.</td></tr>
<tr><td>0</td><td>No mix on CD
OR
Not all tracks present</td></tr>
</table>
Ignore previously assessed work e.g. lead guitar gating</td><td>3</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>5(h)</td><td>
<table>
<tr><th></th><th>Presentation of mix</th></tr>
<tr><td>3</td><td>Beginning and end of mix does not cut out music or tails.
The beginning and end have less than 1 second of silence.
The mix output is near normalised with no distortion.

Allow: long cymbal tail / faded cymbal</td></tr>
<tr><td>2</td><td>Beginning and end of mix do not cut out. The beginning and/or end have a silence of greater than one second.
OR
The mix output is too low OR is compressed OR there is some slight distortion OR is louder than MS “q5”.
OR
Cut reverb/drum tail</td></tr>
<tr><td>1</td><td>Obviously chopped start or ending (not including tails).
OR
The mix output is unacceptably low or too high (distorted) OR excessive use of mix compression causes pumping
OR
Metronome has not been turned off.
OR
Any part is noticeably out of sync / out of tune / missing
OR
Any additional intrusive processing / EQ

IGNORE previously assessed work:
E.g. Vocal delay, lead guitar edit, vocal noise</td></tr>
<tr><td>0</td><td>No mix present on CD.</td></tr>
</table>
</td><td>3</td></tr>
</table>

Question Number	Answer	Mark
6	1 mark for each knowledge and understanding point to a maximum of 5 (AO3). 1 mark for each evaluative point (AO4). *Do not double credit repeats shown in italics.*	20

AO3	AO4
TUNE	
Master pitch control (1)	Analogue needs tuning (1)
MODULATOR	
Low frequency oscillator (1)	
Rate is the frequency of the LFO (1)	Below ≈20Hz (1) Very slow (1) Can be controlled by external clock (1)
Triangle wave (1)	Smooth up and down (1)
VCO	
Voltage controlled oscillator (1) Determines pitch (1) Determines waveshape (1)	
MOD Vibrato (1)	A small amount of vibrato (1) Synth bass would normally have no vibrato (1) Sound out of tune because slow rate (1)
RANGE Selects octave (1) Measured in ft (1)	For synth bass 16' more suitable (1)
PULSEWIDTH Pulse wave (1) Pulse width modulation (1) Mark space ratio (1)	Pulse/square has many harmonics / bright timbre (1) LFO controls pulse width modulation (1) Give some movement to the sound / stop bass sounding static / accept flange/chorus/detuning (1) Pulse width will vary from square wave to thin pulse wave (1) Pulse width will vary slowly (1) Some notes could sound very thin (1) Allow: pulse width on maximum produces a square wave (1)
Saw wave off (1)	If this was switched on, would be more powerful/thicker/harsher (1)
Sub oscillator adds an octave below (1) Square wave sub oscillator (1)	Gives the bass more weight, filling the mix (1) Would make the whole timbre sound an octave lower / octave doubled (1)
White/pink noise (1)	Unpitched (1) No noise so clear/clean tone (1)

VCF	
Voltage controlled filter (1)	
FREQ Low pass filter / LPF (1) Cut-off frequency (1)	Cut-off is high so bass will sound bright (1) Cut-off is high so bass will have many harmonics (1) Fills the mix (1) *This could be intrusive in a busy mix because the bass should sit under the other instruments* (1) Credit diagram: Axes: dB (1). Frequency/Hz (1). LPF shape (1). Slight Q (1).
RES Resonance (1)	Resonance will emphasise the (cut-off) frequency (1) Resonance will emphasise movement in the filter (1) *This could be intrusive in a busy mix because the bass should sit under the other instruments* (1) High resonance is more common with synth bass (1) A relatively low resonance setting won't thin out the bass (1) Allow descriptor of tone, e.g. squelchy (1)
ENV *Envelope* (1)	There will be evolution in the filter, adding movement (1) The cut-off frequency will change (throughout each note) (1) The envelope amount should be increased to give a more pronounced decay / change in cut-off (1)
MOD *Low frequency oscillator* (1)	There will be no cyclic modulation in the filter cut-off (1) Some LFO could be added to the filter to give more movement (1)
KYBD Filter keyboard tracking (1)	Increase filter cut-off with pitch (1) The filter cut-off frequency rises with pitch, so that higher notes do not become dull (1) Allow: reference to velocity sensitivity to the filter (1) This setting means higher notes won't clash as much with other elements of the mix (1) This setting could be higher to ensure higher notes aren't too dull (1)
VCA	
Voltage controlled amplifier (1)	The envelope affects volume (1) Gate would be more appropriate for a synth bass so that there is more sustain / bass doesn't fade / more even level (1) Gate would be more appropriate for a synth bass so that the filter movement can be heard more clearly in the mix (1)

ENV	
Envelope (1) Attack, decay, sustain, release (1)	Zero attack means that the volume/cut-off would start instantly high (1) Zero attack gives bass more punch/accented (1) The long decay means that the volume/cut-off would then fall slowly (to the sustain level) (1) The low sustain level means that note ends would be silent/dull / more sustain would be better so that longer notes are held (1) Zero release means that the volume/cut-off would abruptly stop (when a note is released) (1) Zero release would stop notes overlapping each other; blurring the mix (1) Zero attack/release could cause clicks (1) Credit diagram: Axes: Volume/cutoff (1). Time (1). Instant attack (1). Long decay (1). Zero sustain/release (1).
VOLUME	
	Maximum volume for good signal to noise ratio (1) Maximum volume could cause distortion (1)
PORTAMENTO	
	Slides (quicky) from one note to the next (1) Less precise pitching for fast bass lines (1)
TRANSPOSE	
Low, medium, high (1)	Low would be better for a lower synth bass (1)
BENDER	
	The pitch bend wheel is switched off / centre so has no effect (1) VCO turned up would provide pitch bend (1) *For more expression* (1) VCF turned up would allow cut-off to be altered by the wheel (1) *For more expression* (1) Pushing wheel forward gives vibrato (1) *For more expression* (1)
Analogue/monophonic	
Analogue (1)	Description of analogue character, e.g. warm / phat filter (1) Smooth movement of LFO, filters and pulse width (1) Monophonic so only one note plays at a time (1) Acceptable for bass parts because bass doesn't play chords (1)