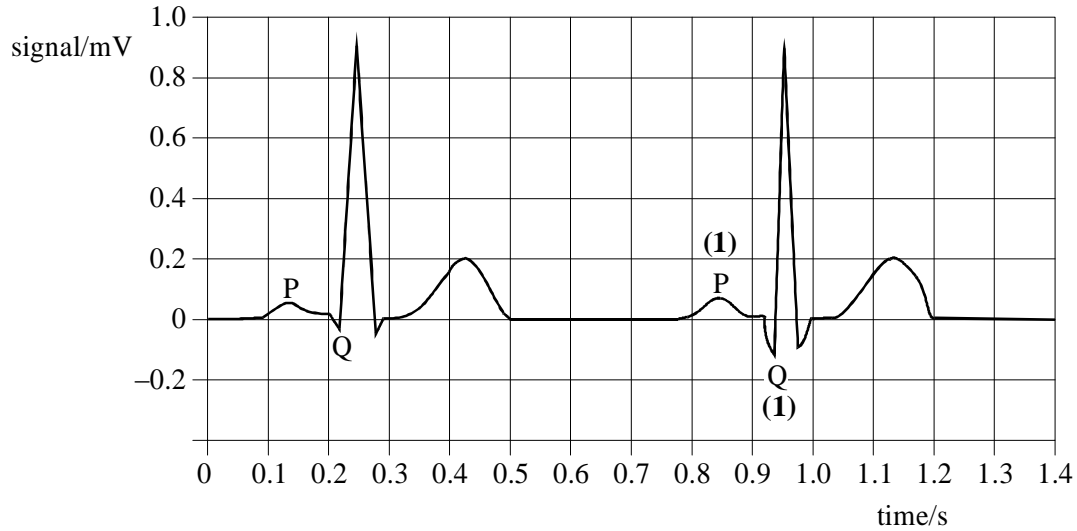


ECG (ANS) - Medical Physics Option

1. (a) pulse amplitude: 0.9 or 1.0 mV (1) 1
- (b) $T = 0.7\text{s}$ (1) 2
- $f = \frac{60}{0.7} = 86 \text{ min}^{-1}$ (1)
- (c) T would get shorter (1)
flat part of trace would shrink (1) 2
- (d)

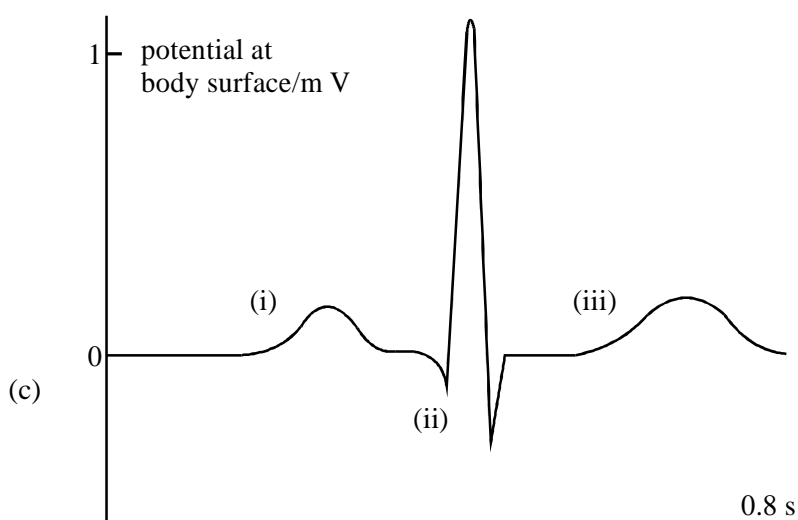


2

[7]

2. (a) electrodes made from a material which does not become polarised
electrodes coated with conducting gel any two (2)
- hair and dead skin removed 2
- (b) high gain
high input impedance any two (2)
- low noise 2

ECG (ANS) - Medical Physics Option



for waveform:

suitable scales (1)

correct shape (1)

for marking in correct position on waveform:

atrial depolarisation (i) (1)

ventricular depolarisation (ii) (1)

ventricular repolarisation (iii) (1)

5

[9]

3. (a) axes: time/ms, action potential/mV (1)

time scale from 1 → 5 (approx) (1)

action potential scale +20 → -80 or +30 → -70 (1)

3

(b) Na^+ ions move into cell (1)

pd rises (from -70 to 0) (or +30), called depolarisation (1)

K^+ ions move out of nerve (1)

pd returns/falls to -70/resting potential, called repolarisation (1)

Na^+ moving from 0 to +30 called reverse polarisation (1)

to restore starting equilibrium of ions, the Na/K pump operates (1)

max 3
QWC 2

[6]

4. (a) pulse causes atria muscles to contract (1)

blood forced into ventricles (1)

pulse delayed before firing ventricular node (1)

ventricles contract (1)

forces blood out of heart to lungs and body (1)

max 4
QWC 2

(b) (i) Na^+ (1)

from outside to inside (1)

(ii) K^+ from inside to outside (1)

3

[7]

ECG (ANS) - Medical Physics Option

5. (a) (i) y-scale: +1 to -0.2 V (1)
 x-scale: 0 to 0.8 s (1)
- (ii) position A: *event* - sino atrial node fires (1)
result - atria contracts (1)
- position B: *event* - ventricular node fires (1)
result - ventricles contract (1) 6
- (b) precaution: remove dead skin
 [or use conducting/electrode gel] (1)
- reason: to give best possible contact between person and electrode (1) 2
- (c) low noise (1)
 high input impedance (1)
 [or any other suitable property] 2

**QWC [1]
[10]**

6. ECG trace to show:
- sec on *x*-axis and mV on *y*-axis (1)
 correct value on *x* axis (0.7 s to end of trace) (1)
 correct values on *y* axis (start at 0, highest point at 1 mV) (1)
 shape of curve (1) 4
- (b)
- | <i>precaution</i> | + | <i>explanation</i> | |
|---------------------------|---|--|---|
| attach firmly | | stop noise | |
| remove dead skin/hair | | reduce contact resistance | |
| use conducting gel | | remove air for better electrical contact | |
| positioning of electrodes | | to get largest pd | |
| | | any two pairs (1) (1) | 2 |

[6]

3

[7]