Question Number	Answer	Additional guidance	Mark
1(a)	1. Chromosomes / eq (continue to) condense ; 2. Nuclear envelope breaks down ; 3. Spindles (fibres) form ; 4. Nucleolus breaks down / eq ;	1 IGNORE become visible	(3)

Question Number	Answer	Additional guidance	Mark
1(b)	1. (pH sensitive cells) detect a change in blood pH / eq ; 2. These are in the {carotid body / carotid artery / aortic body / aorta / medulla } ; 3. Alter impulse rate to brain / eq ; 4. Ref to cardiac centre ; 5. in medulla ; 6. Change impulse rate of SAN ;		(4)

Question Number	Answer	Additional guidance	Mark
1(c)	1. Idea that reproduce rapidly / {robust/hardy} so many can be formed rapidly ; 2. Easy to culture / eq ; 3. (HeLa cells) susceptible to disease / HPV / eq ; 4. Genome known / eq ; 5. Idea that they have no Hayflick limit ;	2. ACCEPT cheaper (as continual supply) 3. ACCEPT other named disease 4 ACCEPT ref to (HeLa) cells are human	(3)

Question Number	Answer	Additional guidance	Mark
* 1(d)	(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. Phospholipid bilayer ; 2. Idea of its hydrophobic properties inhibit movement of ions across membrane ; 3. Na^+ gated channel present ; 4. To allow Na^+ to enter during depolarisation / to open when local currents occur ; 5. K^+ channels ; 6. To allow K^+ to diffuse ; 7. Sodium–potassium pump / eq ; 8. To {export Na^+/ import K^+} ; 9. Role of pump in neurone membrane ; 10. Idea that only parts of the membrane may be involved e.g. nodes of Ranvier ;	QWC emphasis is logical sequence IGNORE myelin sheath comments? 3. ACCEPT voltage-gated / protein channels 9 ACCEPT role with regard to the resting potential ; 10. ACCEPT salutatory condition ;	(6)

Question Number	Answer	Additional guidance	Mark
1(e)	1. Idea of double stranded only in HeLa ; 2. Idea of to many H bonds in HeLa / {complementary bases / base pairs} ; 3. Thymine only found in HeLa genetic material / uracil only in poliovirus ; 4. Sugar present in HeLa is deoxyribose / ribose in poliovirus / eq ;	1 ACCEPT double helix in HeLa only	(3)

Question Number	Answer	Additional guidance	Mark
1(f)	1. brown shown as dominant / white shown as recessive e.g. use of upper and lower case; **Parental generation:** 2. both types shown as homozygous ; **F1:** 3. All shown as heterozygous ; **F2:** 4. Genetic diagram to show that 75% are brown / 25% are white ;	This could be gleaned from gametes 4. Diagram should show genotypes	(4)

Question Number	Answer	Additional guidance	Mark
1(g)	1. Allow continual division (of hybrid) ; 2. Idea of continual production of (monoclonal) antibodies ;	1. ACCEPT division is rapid / eq;	(2)

Question Number	Answer	Additional guidance	Mark
1(h)	1. Modification of {genome / DNA / eq} ; 2. Ref to the addition of {genetic material / eq} from another {organism / species / eq} / eq ;		(2)

Question Number	Answer	Mark
1(i)	D (2^{50}) ;	(1)

Question Number	Answer	Additional guidance	Mark
1(j)	Any two for 1 mark: Carbon/hydrogen/oxygen/nitrogen ; ;	ACCEPT as chemical symbols	(2)

Question Number	Answer	Additional guidance	Mark
2(a)	**A** - cell body ; **B** - axon ;		**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	1. increasing Eugenol concentration increases percentage inhibition / positive correlation ; 2. description of non linear correlation ; 3. credit correct manipulation of the data e.g. between 0.1 and 1.0 mmol dm^3 percentage inhibition to increase by 55% ;	ACCEPT 2 – e.g. greatest increase in inhibition is between eugenol concentration of 0.2 and 0.4 mmol dm^{-3}	**(2)**

Question Number	Answer	Additional guidance	Mark
***2(b)(ii)**	QWC – Spelling of technical terms (*shown in italics*) must be correct and the answer must be organised in a logical sequence) 1. {reduced / eq} Ca^{2+} enters { *presynaptic membrane* / into *sensory neurone*} ; 2. due to Ca^{2+} channel not opening / decreased sensitivity of *membrane* to Ca^{2+} ; 3. fewer *vesicles* {move towards / fuse} with *presynaptic membrane* ; 4. less *neurotransmitter* {released into / less diffuses across} {*synaptic* gap / eq} ; 5. less *neurotransmitter* binds to receptors on {*post-synaptic membrane* / adjacent neurone} ; 6. idea of reduced depolarisation / less Na^+ or cation channels open ; 7. idea of { threshold intensity */ action potential / impulse*} less likely to occur ; 8. idea of pain not being sensed as impulse {stopped before entering CNS / leaving the *sensory neurone*} *;*	ACCEPT 1 – into *synaptic* knob / pre-synaptic neurone ACCEPT 4 (& 5) - named neurotransmitter example ACCEPT 7 - not reached as alternative to less likely to be reached	**(6)**