

SECTION A

Question		Marking point	Answers	Notes	Total
1.	a		metaphase ✓		1
	b		<i>a</i> chromosomes are condensed OR uneven distribution of chromatin OR discrete chromosomes ✓		2 max
			<i>b</i> cell plate OR two similarly sized smaller adjacent cells ✓		
			<i>c</i> no nuclear membrane OR nucleus not clearly visible ✓		
			<i>d</i> <condensed> chromosomes lined up in the centre ✓		
	c		<i>a</i> count the total number of cells visible ✓		2 max
			<i>b</i> count the number of cells undergoing mitosis ✓		
			<i>c</i> mitotic index = $\frac{\text{number of cells undergoing mitosis}}{\text{number of cells visible}}$ ✓		

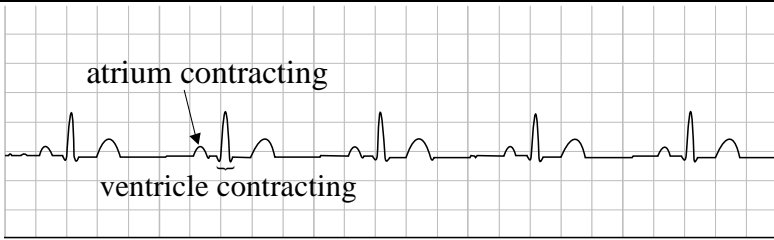
Question		Marking point	Answers	Notes	Total
2.	a	<i>a</i>	light dependent reactions including reduction of NADP ceases ✓		2
		<i>b</i>	glycerate – 3–phosphate can no longer be converted to triose phosphate so levels rise ✓		
	b	<i>a</i>	concentration would rise ✓		3 max
		<i>b</i>	reduced NADP produced in the light ✓		
		<i>c</i>	glycerate –3–phosphate converted to triose phosphate ✓		
		<i>d</i>	triose phosphate converted to ribulose biphosphate ✓		
3.	a	<i>a</i>	both boat samples grow in copper concentrations up to 0.1 mg dm^{-3} <whereas unpolluted site algae do not> ✓		2
		<i>b</i>	growth of both boat samples higher than unpolluted site at all copper concentrations ✓		
	b	<i>a</i>	variation in tolerance OR some algae more copper tolerant than others ✓		3 max
		<i>b</i>	copper kills algae that lack tolerance ✓		
		<i>c</i>	tolerant individuals reproduce and pass advantageous alleles onto offspring ✓		
		<i>d</i>	frequency of advantageous alleles rises in population ✓		

Option D — Human physiology

Question			Marking point	Answers	Notes	Total
20.	a			100 % <greater than initial level> ✓		1
	b	i		build more muscle ✓		1
	b	ii		thyroid damage OR elevated cholesterol OR liver damage ✓		1
	c			source of energy OR used when glycogen stores are running out ✓		1
	d		<i>a</i>	fat soluble so can pass through plasma membrane ✓		2 max
			<i>b</i>	bind to receptors in the cytoplasm to form receptor-hormone complex ✓		
			<i>c</i>	initiate transcription of specific genes ✓		

Question		Marking point	Answers	Notes	Total
21.	a		<i>a</i> detoxifies blood ✓		2 max
			<i>b</i> breaks down erythrocytes ✓		
			<i>c</i> excess cholesterol is converted to bile salts ✓		
	b		<i>a</i> liver decreases synthesis of cholesterol when dietary cholesterol rises ✓		2 max
		<i>b</i> dietary cholesterol inhibits enzyme catalyzing liver cholesterol synthesis ✓			
		<i>c</i> cholesterol from both sources used in body to waterproof skin/synthesize vitamin D/synthesize steroid hormones ✓			
	c	i	jaundice ✓		1
	c	ii	<i>a</i> any cause of increase rate of hemolysis ✓		1 max
			<i>b</i> malaria ✓		
			<i>c</i> genetic ✓		
			<i>d</i> defects in bilirubin metabolism ✓		
			<i>e</i> cirrhosis ✓		
22.	a		<i>a</i> bowed legs <i>OR</i> soft bones ✓		1 max
			<i>b</i> lack of mineralization ✓		
	b		lack of vitamin D/calcium ✓		1

(Question 22 continued)

Question		Marking point	Answers	Notes	Total
	c	a	vitamin: vitamin D ✓		2
		b	hormone: testosterone/androgen/estrogen/progesterone ✓		
23.	a		arrhythmia OR ventricular fibrillation ✓		1
	b		defibrillation ✓		1
	c		image I 		
		a	atrium contracting correctly marked on image ✓		2
		b	ventricle contracting correctly marked on image ✓		
	d		myogenic contractions OR branched ✓		1

Question		Marking point	Answers	Notes	Total
24.	a		iron ✓		1
	b				
		<i>a</i>	correct position to left of adult hemoglobin ✓		2
		<i>b</i>	shape similar to adult hemoglobin ✓		

Question		Marking point	Answers	Notes	Total
25.		<i>a</i>	CO ₂ combines in RBCs with H ₂ O to produce carbonic acid/H ₂ CO ₃ ✓		6 max
		<i>b</i>	catalysed by carbonic anhydrase ✓		
		<i>c</i>	⟨carbonic acid⟩ dissociates to form hydrogencarbonate ions and hydrogen ions/HCO ₃ ⁻ + H ⁺ ✓		
		<i>d</i>	dissociation of carbonic acid is a reversible reaction so can act as a buffer ✓		
		<i>e</i>	H ₂ CO ₃ ⇌ H ⁺ + HCO ₃ ⁻ ✓		
		<i>f</i>	hydrogencarbonate ions move out of RBCs by facilitated diffusion ✓		
		<i>g</i>	the carrier protein moves a chloride ion/Cl ⁻ into RBC ✓		
		<i>h</i>	chloride shift keeps charge balance across membrane stable ✓		
		<i>i</i>	in low pH, tendency to dissociate will be low and equation will shift to left/less hydrogencarbonate plus hydrogen ions formed ✓		
		<i>j</i>	in high pH, tendency to dissociate will be high and equation will shift to right/more hydrogencarbonate plus hydrogen ions formed ✓		
		<i>k</i>	hemoglobin can act as a buffer combining with hydrogen ions to produce hemoglobinic acid ✓		