AQA, OCR, Edexcel

A Level

A Level Biology

Maths Answers: Score /81

Name: Maths Skills for A level Biology

Guidance

1. Read each question carefully.
2. Don't spend too long on each question.
3. Attempt every question.
4. Always show your workings.

Revise A Level Biology:
www.MathsMadeEasy.co.uk/a-level-biology-revision/

1a and 1b

6 (g dm^{-3});	1	
Correct answer of (–)0.14;; 1 mark for correct difference in concentration (5) divided by 35 / (69 – 64) ÷ 35 / 1 ÷ 7	2	Ignore +/- sign Ignore additional d.p. Accept 0.31(4) for 1 mark if female data used

2.

Choice: (Student's) *t*-test; Reason for choice: Looking for differences between two means; Explanation: Difference is significant / not due to chance because the P value is 0.04 / is less than 0.05;	3	Reason: Allow comparing contrasting two means Explanation: Assume 'it' means difference Explanation: Reject result / data is significant / not due to chance Explanation: do not accept P value is less than 0.04

3.

6 000 000 OR 6×10^{6};;	2	1 mark for 3 000 000 OR 3×10^{6} Allow 1 mark for 600 (in $1cm^{3}$ of diluted culture)

4.

Correct answer 23.55 – 24 two marks;; For one mark 5.9 OR 94.2;	2	

5.

Correct answer of 4.92, 2 marks;; If N(N-1) = 3540, **OR** ∑n(n-1) = 720, then award 1 mark	2	Accept 4.916/4.917/4.9

6.

Correct number of times between 13.0/12.96 **and** 13.9/13.92 scores 2 marks;; One mark if correct sizes in ranges of 150.7nm to 154.4nm/ 0.151µm to 0.154µm **and** 1953.5nm to 2097.6nm/ 1.954µm to 2.098µm;	2	**Both** lengths required for 1 mark credit Accept refs to150/0.15 and 2000/2 Ignore number of sig fig

7.

1. Accept answers in the range 33840 to 34680;	1	

8.

1. Correct answer of 298000 or 297766 or 297765.59 or 296826 = **2 marks**;; 2. Incorrect answer but working shows 2000×2.72 = **1 mark**; **OR** Incorrect answer but working shows $2.72^{0.5 \times 10}$ / 2.72^5 / $e^{0.5 \times 10}$ / = **1 mark**	2	1. Accept: any equivalent answer with appropriate rounding e.g. 2.98×10^5, 29.78×10^4 etc.

9.

1. Correct answer in range of 4.9×10^{-4} to 4.91×10^{-4} = **2 marks**;; 2. Incorrect answer buts shows division by 24 = **1 mark** **OR** Incorrect answer but shows a number from 1175 to 1178 (ignore position of decimal point, standard form and any numbers that follow) = **1 mark**; **OR** Incorrect answer but show the number 49 (ignore position of decimal point, standard form and any numbers after 49) = **1 mark**;	2	1. Accept any equivalent mathematical representation of this answer

10.

1. Correct answer of 1.9/1.93 x 10^{25} = **2 marks**;; 2. Incorrect answer but shows 84 = **1 mark** **OR** 28 x 3 = **1 mark** **OR** Incorrect answer but shows 672 divided by 8 = **1 mark**;	2	1. Accept 2 x 10^{25} = **2 marks** 1. Ignore any numbers after 1.93

11.

1. Horses **because** more antivenom/antibodies could be collected (as more blood collected); 2. 4550 (cm^3) v 26 (cm^3) (blood collected);	2	2. Accept 175 rabbits needed to (collect the volume of blood from) one horse.

12.

1. There is a less than 0.05/5% probability that the difference(s) (between observed and expected) occurred by chance; 2. Calculated value is greater than critical value so the null hypothesis can be rejected; 3. (The scientists can conclude that) the proportion of plants that produce 2n gametes does change from one breeding cycle to the next;	2 max	1. Reject 'results (without reference to difference) occurring by chance'. Overall max 1 with this statement. 1. Accept 'there is a greater than 0.95/95% probability that the difference did **not** occur by chance'. 1. and 2. Ignore 'difference is significant' 2. Do not accept 'P value' for 'critical value'.

13.

1.93×10^{11};; Allow 1 max for $578/3.0 \times 10^{-9}$ 1.93×10^{x} when $x \neq 11$ Correct answer with incorrect standard form e.g. 19.3×10^{10}	2	Accept any number of significant figures ≥2, if rounding correct ($1.926^{\bullet} \times 10^{11}$). Same principle applies to one max answers.

14.

(-) 84.1(%);;	2	Accept (-) 84.15(%) Allow 1 mark for 84 **OR** $\frac{2.82 \times 10^{-7} - 4.47 \times 10^{-8}}{2.82 \times 10^{-7}}$ **OR** $\frac{2.37 \text{ x } 10\text{-}7}{2.82 \times 10^{-7}}$

15.

C. 550 seconds;	1	

16.

$8.64 \text{ x } 10^{5}$;;	2	Accept 864 000 however expressed, e.g. $864 \text{ x } 10^{3}$ Allow one mark for $2^{6} = 64$ **OR** $64 / 2^{6} \text{ x } (1.35 \text{ x } 10^{4})$

17.

4.88×10^{-6} ;;; If answer incorrect **EITHER** Allow 1 mark for 0.244 Allow 1 mark for 1.22×10^{-5} **OR** Allow 1mark for 12200 / 1.525 Allow 1 mark for 0.61	3	Accept 5×10^{-6} Accept correct answer however expressed Max 2 for incorrect final answer

18.

Two marks for correct answer in range of 1.75 to 1.76032;;	2	Accept for 1 mark, incorrect answer using radius 0.87 / 0.88 / 0.880 / 0.8802 / 0.88015; **OR** Accept for 1 mark, incorrect answer with correct rearranged equation, e.g., Radius = $\sqrt{(\text{surface area} \div 4\pi)}$ **OR** $= \sqrt{9.73 \div 12.56}$ **OR** $= \sqrt{0.77} / \sqrt{0.774} / \sqrt{0.775}$ **OR** $r^2 = \text{surface area} \div 4\ \pi$ **OR** $r^2 = 9.73 \div 12.56$ **OR** $r^2 = 0.77 / 0.774 / 0.775$

19.

3.57 / 3.6 / 3.7 / 3.71 / 3.8 (%);;	2	If the answer includes additional decimal places, award the marks if it would round to a correct answer There are 3 cells in anaphase Accept for 1 mark, 101.25 / 101 (students estimate in minutes) OR 3.75 (difference between scientist estimate and student's estimate in minutes) Ignore plus or minus signs

20.

2×10^{-3} / 2.0×10^{-3} / 2.01×10^{-3};;	2	If the answer includes additional decimal places, award the marks if it would round to a correct answer Accept for 1 mark, correct answer not in standard form 0.002 / 0.00201 / 0.002014; OR Correct calculation using incorrect figure from table (9.2) 0.003 / 0.0031 / 0.00319 / 3 x 10^{-3} / 3.0×10^{-3} / 3.19×10^{-3} / 3.2×10^{-3} OR Correct calculation with answer expressed as g hr^{-1}, 0.12 / 0.121 / 1.2×10^{-1}

21.

3.75×10^9 / 3 750 000 000;;	2	Accept for 1 mark: 3750 000 / 3.75×10^6 (cells per mm^3) OR 3.75×10^{12} (wrong volume conversion) OR 3750 (cells per mm^3 of diluted culture) OR Evidence of using correct dilution conversion and correct volume conversion, i.e., x1000 and x 1000

22.

1.8×10^8;; If correct difference but expressed in non-standard form, award 1 mark;	2	Award 1 mark if answer given as 1.8×10^{-8}

23.

32.73 / 32.7 / 32 / 33;; Award 1 max for **either** 409 (409.2) for difference in volume (but incorrect number of mitochondria); **OR** Answer of 262 (261.9) (using diameter, rather than radius);	2	

24.

5.6×10^6 (red blood cells per mm^3);; Award 1 max for **one of** 2.8×10^4 (standard form but ignoring dilution) **OR** 5 600 000 (correct but not standard form) **OR** 5.6×10^5 (failure to use depth of liquid on slide);	2	

1. (µg because) very little ammonia (in soil); 2. (µg because) avoids use of (lots of) decimal places (in their results) / avoids the use of powers of 10 / avoids the use of standard form; 3. (g^{-1}) to allow comparisons (between samples);	2 max	2. Accept makes numbers more manageable 2. Accept makes easier to plot graph
Answer between 4.5 and 4.6 µg g^{-1} day^{-1};; Award 1 mark for correct number but wrong / no units	2	Ignore plus or minus signs Accept 'per gram' **AND / OR** 'per day'

25a and 25b.

26.

Value between 20,750 (83mm) and 21,250 (85mm) two marks;; Formula given/used but calculation wrong, award 1 mark	2	Magnification = $\frac{\text{image size}}{\text{Object size}}$ (Large number divided by 4)

27.

1. Line graph with rate on y axis and days/time in days on x axis and linear scales; 2. Correct units of µg min^{-1}/per minute/$minute^{-1}$ × 10^{-3}; 3. Rates correctly calculated and plotted, with line connecting points/line of best fit and no extrapolation;	3	Correct answers × 10^{-3} 1.17, 1.50, 1.83, 2.50, 3.33, 4.00, 4.00 (accept to 1DP) 2. Reject m^{-1} 2. Reject if put 10^{-3} on axis for each point 2. '/' means separating units from what goes before i.e. accept sucrose hydrolysis per min / µgx10^{-3} 3. Do not accept a ruled **straight line** of best fit Accept y axis starting at 1

28.

1. Tangent to curve drawn; 2. Value in range of 8 to 11;	2	1.Tangent drawn at about 10 minutes 2.1 mark only for correct answer

29.

1. 10 cm^3 of 10 000 nmol dm^{-3}/ (original) solution; 2. 90 cm^3 of water;	2	If ratio correct but make wrong volume e.g. 1 litre, award 1 mark

30.

66.7;	1	

31.

70;	1	

32.

$\left(\frac{length\ of\ chloroplast}{length\ of\ bar}\right)$ µm;	1	

33.

Add 4.5 cm^3 of (1.0 mol dm^{-3}) solution to 25.5 cm^3 (distilled) water;	2	If incorrect, allow 1 mark for solution to water in a proportion of 0.15:0.85

34.

28.8 / 29;	2	If incorrect, allow: $\frac{6}{200} \times 960 = 1$ mark

35a and 35b.

4;	1	
2.68(6);	2	If answer incorrect: $\Sigma n(n-1) = 242 = 1$ mark $N(N-1) = 650 = 1$ mark

36.

0.975/0.98;	2	If incorrect, 0.26 × 6 / or incorrect numbers divided by 1.6 for 1 mark

37.

0.32;	2	Correct answer = 2 marks Accept 32% for 1 mark max Incorrect answer but identifying 2pq as heterozygous = 1 mark

38.

115.2/115.3 (cm^3 $minute^{-1}$);	1	

39.

10 130; Tolerance of ± 1	2	$N = \frac{M \times C}{R}$ = 1 mark

40.

Length of bar in mm × 1000;	1	

41.

1. Rank all STs in ascending order; 2. Find value with same number (of people) above and below;	2	2. Accept find middle value