



# **A-Level Biology**

## **Y12 Practical Questions**

### **Mark Scheme**

**Time available: 87 minutes**

**Marks available: 72 marks**

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## Mark schemes

**1.**

- (a) **One mark** for each row.

If values do not match the given unit, **max 1**.

Concentration of copper sulfate solution/ $\text{g kg}^{-1}$	Volume of 100 g $\text{kg}^{-1}$ copper sulfate solution / $\text{cm}^3$	Volume of water / $\text{cm}^3$
75	22.5	7.5

*Accept  $\text{dm}^3 / \text{mm}^3$  for volume unit.*

*Accept  $0.0225/2.25 \times 10^{-2}/22\ 500$  and  $0.0075/7.5 \times 10^{-3}/7500$*

*Ignore units in 2nd row.*

*Do not accept  $\text{mm}^{-3}/\text{cm}^{-3}/\text{dm}^{-3}/\text{ml}$*

2

- (b) 1. Density of 10% protein solution = 1.028;  
2. More dense (than 25 g  $\text{kg}^{-1}$  copper sulfate solution);

2

- (c) 16.5 **and** 22;

*Must be in correct order*

1

(d) Any **three** from:

(Tom)

1. (Healthy donor) not allowed to donate;
2. Less blood collected

OR

Fewer patients treated;

3. Cause Tom anxiety (about his health);

(Lucy)

4. (Gives blood) when it may not be safe (for her) to do so;
5. (Her blood) may not help patients;
6. Her (missed) low haemoglobin goes untreated;

**Max 2** for either Tom or Lucy

*If no credit awarded, max 1 mark for idea of too little haemoglobin left to carry oxygen in blood*

**OR**

*reduced oxygen to respiring tissues*

3 max

**[8]**

2.

- (a) 1. (Some bacteria have) alleles for resistance;  
*Reject reference to immunity only once*  
*Accept gene for allele*  
*Reject if antibiotics cause production of resistance gene/allele*

2. (Exposure to) antibiotics is the selection pressure

**OR**

Non-resistant bacteria die

**OR**

Resistant bacteria survive/reproduce;

*Reject reference to immunity only once*

*Accept strain for bacteria*

3. More antibiotics used in hospital (compared with elsewhere)

**OR**

Patients have weakened immune systems

**OR**

(So) high frequency of resistance allele (in bacterial population);

*Accept gene for allele*

*Ignore antibiotics prescribed when not needed OR antibiotic course is not finished*

*Ignore defence system, for immune system*

*Accept proportion/percentage for frequency*

3

- (b) Maltose;

*Reject maltase*

*Accept phonetic spelling eg moltose/maltosse/maltoze/moltoes /maltoez*

1

- (c) 1. Wash hands with soap

**OR**

Disinfect surfaces;

*Ignore sterilise hands OR surfaces*

*Accept sanitise for disinfect*

*Accept antiseptic /antimicrobial/alcohol (wipes)*

*Accept a named type of disinfectant*

2. Use sterile pipette/syringe (to transfer bacteria);  
*Reject loop*  
*Accept use unopened pipette/syringe for sterile*
3. (Remove bottle lid and) flame neck of bottle;
4. Lift lid of (agar) plate at an angle;  
*Accept lift lid slightly OR keep lid over plate*  
*Ignore work quickly with lid off*
5. Work close to upward air movement;  
*Reject air movements sterilise air*  
*Accept convection current for air movement*
6. Use sterile spreader;  
*Accept loop for spreader*  
*Examples of sterilising technique eg, flame OR dip in alcohol and flame OR dip in disinfectant and rinse (in sterile water)*
7. Place pipette/spreader into disinfectant (immediately after use);  
*Accept a named type of disinfectant*

**3 max**

(d) **For**

1. Resistant bacteria grow faster with trehalose;  
*Accept C. difficile/strain for bacteria*
2. (So) resistant bacteria (likely to) increase in frequency in the population/people;  
*Accept C. difficile/strain for bacteria*  
*Accept 'percentage/proportion' for 'frequency'*
3. Resistant bacteria (likely to) outcompete non-resistant bacteria;  
*Accept C. difficile/strain for bacteria*

## Against

4. In laboratory not in people;  
*Accept C. difficile/strain for bacteria*
5. Other disaccharides (in the diet) might affect bacteria;  
*Accept C. difficile/strain for bacteria*  
*Accept carbohydrate OR polysaccharide OR sugar, for disaccharide*
6. Other bacterial species (in the body) might affect bacteria;
7. No stats test to see if difference/increase is significant;  
*Accept 'is not due to chance' for 'is significant'*  
*Ignore standard deviation/SD (as not a stats test)*  
*Reject 'to see if results are significant'*
8. No data for both resistant and non-resistant bacteria growing together;
9. No data for different concentrations of trehalose;

3 max

*Max 2 if only 'For' or only 'Against' marks*

[10]

3.

- (a) 1. (Rate of) transpiration/evaporation increases due to increased temperature  
**OR**  
(Rate of) transpiration/evaporation increases due to increased light intensity  
**OR**  
(Rate of) transpiration/evaporation increases due to decreased humidity  
**OR**  
(Rate of) transpiration/evaporation increases due to increased wind/air movement;  
*Reject tide affecting transpiration/water potential/humidity*  
*Correct link needed between factor affecting transpiration and the explanation*
2. (So) increased kinetic energy (causing more water loss)  
**OR**  
(So) increased water potential gradient (so more water lost)  
**OR**  
(So) increased (water) diffusion gradient (so more water lost);  
*Reject tide affecting transpiration/water potential/humidity*  
*Correct link needed between factor affecting transpiration and the explanation*
3. Stomata open (at sunrise/after 5 am) allowing gas exchange  
**OR**  
Stomata open (at sunrise/after 5 am) allowing carbon dioxide to enter;
4. (Some) stomata close at midday/after 11 am (reducing transpiration);  
*Accept at 11 am as the time when stomata close*  
  
*Ignore reference to tide*

4

(b) Correct answer for 2 marks, 6.6; 6.67 – 7 (%);;

Accept for 1 mark,

0.05 (correct difference in transpiration rate)

**OR**

6.6 (correct calculation, but incorrect rounding)

**OR**

6.25/6.3 (correct calculation using incorrect denominator)

**OR**

666/667 correct number sequence but decimal place in wrong place eg  
66.7/0.0667

**OR**

0.75 as denominator

2

(c) 1. **Mark in groups, either 1 to 4 OR 5 to 8**

1. Record mass/length before **and** after;

2. Place in sea water for (specified/equal) time;

*Ignore period of time*

*Accept seawater in a dilution series*

*Ignore blot dry before initial mass measurement*

*Reject 'size' once then allow ECF.*

3. Method to remove surface water;

*Accept eg use tissue paper to dry OR blot dry*

4. Increase in mass/length shows water has been absorbed by osmosis

**OR**

Increase in mass/length shows cells have lower water potential;

*Accept root/mangrove for cells*



**OR**

5. Put tissue/cells on (microscope/glass) slide;
6. Add seawater (and leave)
7. Observe under (optical) microscope;
8. If cells become flaccid they do not have a lower water potential than seawater

**OR**

(If cells become) turgid cells show water is absorbed by osmosis

**OR**

(If cells become) turgid cells show cells have a lower water potential

**OR**

(If cells are) not flaccid/plasmolysis cells show water is not lost by osmosis

**OR**

(Determine) percentage plasmolysis;

*Accept description of turgid (cells)*

4

*Accept 'weight' for 'mass'.*

*Accept 'diameter' for 'length'.*

**[10]**

**4.**

- (a) 1. Amylase hydrolyses starch;
2. (To) maltose;

2

- (b) 1. (E) Amylase/enzyme is denatured;  
*Accept a description of denaturation*

2. (F) amylase is needed for/causes starch hydrolysis/breakdown/digestion

**OR**

(F) water (alone) does not (cause starch) hydrolysis/breakdown/digestion;

*Ignore 'it is a control'*

2

- (c) 1. Heat in Benedict's (solution);  
*Reject description of non-reducing sugar test*

2. Red/green/orange (precipitate/colour) (shows maltose/reducing sugar);  
*Accept for 'heat', water bath*

2

(d) Correct answer for 2 marks = 7;;

Accept for 1 mark,

7.2 (correct answer but not rounded)

**OR**

Evidence of  $1.6 \div 4.0/0.4/40\%$  (correct dilution factor)

**OR**

Evidence of 0.08 (correct amylase volume in  $0.2\text{cm}^3$ )

2

- (e) 1. Reduces (human) error/uncertainty;
2. (It is) the resolution of a ruler;
3. (For a ruler measurement) the uncertainty is  $\pm 1(\text{mm})$

**OR**

(For a ruler measurement) the true value lies with  $\pm 1(\text{mm})$ ;

*Ignore can only measure to whole numbers*

*Ignore reliability and precision*

*Accept, the uncertainty of a ruler reading is  $(\pm)0.5(\text{mm})$  OR readings of  $< 1\text{mm}$  are not accurate*

1 max

[9]

5.

- (a) 1. Method of randomly determining position (of quadrats) e.g. random numbers table/generator;  
*Ignore line/belt transect.*
2. Large number/sample of quadrats;  
*Accept many/multiple/lots but ignore several.*  
*Ignore point quadrat.*  
*Accept squares/frames (of a grid) for quadrats.*  
*If a specified number is given, it must be 10 or more.*
3. Divide total percentage by number of quadrats/samples/readings;

3

- (b) 1. Increase in variety/diversity of species/plants/animals;

**OR**

Increase in number of species/populations;

*Accept increase in biodiversity or species richness.*

2. Provides more/different habitats/niches

**OR**

Provides greater variety/types of food;

*Ignore shelter/homes/environments.*

*Ignore 'more food' but accept 'more food sources'.*

*Accept 'less hostile' (environment).*

2

- (c) 1. Significant (difference/decrease) with **C** (compared with **A**);

2. No significant (difference/decrease) with **B and D** (compared with **A**);

**Mark points 4 to 9 = 4 max.**

*Accept names of fish species present as alternatives to sets **B, C** and **D**.*

*Award both marks if answer states **only C** is significantly (different/lower).*

*'Results are significant/not significant' disqualifies first of these marks credited.*

3. Reference to less than 5%/0.05 probability that difference is (less likely) due to chance

**OR**

Reference to more than 95%/0.95 probability that difference is not due to chance;

*Accept equal to specified probabilities.*

4. Species of algae not known

**OR**

Species of algae may differ (on other reefs);

5. Only done off (coast of) Florida

**OR**

Not done on other reefs;

6. Only done at 16 to 18 metres

**OR**

Not done (on reefs) at other depths;

7. Only 34 weeks;
8. Concrete/artificial reef could affect results/growth

**OR**

Natural reef results/growth may differ;

*Accept any reference to composition of reef being different (from natural).*

9. Cage may allow other fish/animals to enter;

5 max

[10]

6.

- (a)
1. Add 1 part (bacteria) culture to 9 parts (sterile) liquid (to make  $10^{-1}$  dilution);  
*Accept water / nutrient / broth for liquid*
  2. Mix (well);  
*Accept stir*
  3. Repeat using 9 parts fresh (sterile) liquid and 1 part of  $10^{-1}$  and  $10^{-2}$  dilutions to make  $10^{-3}$  dilution;

**OR**

Add 1 part  $10^{-1}$  (suspension) to 99 parts (sterile) liquid (to make  $10^{-3}$  dilution);

*Accept water / nutrient / broth for liquid*

*Reject 1 part (undiluted) culture added to 999 parts liquid*

3

- (b)  $3.75 \times 10^9 / 3\ 750\ 000\ 000$ ;;

*Accept for 1 mark:  $3750\ 000 / 3.75 \times 10^6$  (cells per  $\text{mm}^3$ )*

*OR*

*$3.75 \times 10^{12}$  (wrong volume conversion)*

*OR*

*3750 (cells per  $\text{mm}^3$  of diluted culture)*

*OR*

*Evidence of using correct dilution conversion and correct volume conversion, i.e.,  $\times 1000$  and  $\times 1000$*

2

- (c)
1. **Count** unlikely to be accurate / repeatable / reproducible / reliable;
  2. Because too many cells;

**OR**

Because cells overlapping / not spread out;

2

- (d) 1. Tetracycline used more often / in higher doses;
2. Resistant bacteria more likely to (survive and reproduce and) pass on allele/gene for (tetracycline) resistance;  
**OR**
3. More / higher frequency of mutations (for tetracycline resistance);  
*Reject reference to mutation being caused by use of antibiotic*
4. (so) gene passed on to more bacteria;  
**OR**
5. Tetracycline used over longer time period;
6. More time for (chance) mutation to occur / for selection to occur;  
*Ignore reference to resistant animals*  
*Ignore reference to immunity*

2

- (e) No selection against resistant bacteria / resistance gene/allele;  
**OR**  
Bacteria pass on (resistance) gene / allele when they reproduce;  
**OR**  
Bacteria resistant to tetracycline are passed on from one generation of farm animals to the next (probably via faeces);  
**OR**  
Environment does not change, so stabilising selection occurs;  
*Accept no selection to get rid of it*  
*Reject reference to mitosis or immunity*

1

[10]

- 7.** (a) (So results) can be compared / so measurement is the same each time / because eye is not perfectly round / uniform;  
*Accept eye opens to different amounts*

1

- (b) (i) 1. Eye (diameter) is smaller and antennae longer;
2. Antennae detecting touch;
3. Data only refers to shrimps / data may not apply to all animals / only in one area;  
*The principle here is that candidate has recognised that both features confirm suggestion. Exact wording does not matter.*

2 max

- (ii) 1. Standard deviation gives a measure of spread / variation;  
2. More standard deviations overlap, the less likely it is that differences are real / significant / the more likely they are caused by chance;  
*Do not accept range*  
*Accept converse.*  
*Although we are looking for the idea of significance, we cannot require this term.*

2

- (c) (i) Qualitative statement about  
difference in size /  
difference in variation /  
overlap in size;

Quantitative statement about  
difference in size /  
difference in variation /  
overlap in size;

Supported by relevant two sets of figures from graph;;

*Note simplistic answer involving a quantitative statement gains 1 mark.*

*More specific answer involving quantitative information gains 2 marks.*

2

- (ii) (No) for same body length, antenna are longer / antenna are shorter / some with longer body have short antennae / some with shorter body length have longer antennae;

**OR**

(Yes) positive correlation in open / in cave;

*Habitat not critical as a term.*

*Must refer to idea of same habitat*

*Accept description*

1

- (d) More alleles of each gene / shrimps in open have all the alleles;

*Candidates are required to use the information from the table. Must therefore refer to alleles.*

1

- (e) 1. A small number of shrimps were / went into the cave;
- 2. All / high proportion of shrimps had allele L;
- 3. Cave population descended from these / these reproduce;

3

- (f) (i) 1. Cross shrimps from two sites / watch courtship;
- 2. Breed young together / observe mating;
- 3. Allow 1 mark for any method of improving quality of results e.g. carry out reciprocal crosses / large number of crosses / isolate beforehand;  
*Other valid equivalent suggestions should be accepted.*

- (ii) If same species the shrimps would breed, producing fertile young / courtship species specific;  
*Accept any form of evidence – mating / laying eggs / giving birth to young.*

3

**[15]**