Question	Answers	Associated Misconception(s)
1. You have a total sample of 500 individual cheatgrass plants taken from one area of grassland for use in these experiments (100 in each treatment group). Why should you choose randomly which group each plant is placed in?	a. It should lead to plants with variable characteristics being distributed fairly evenly	CORRECT ANSWER – balanced groups are vital to assess the affect of different species on growth rates
	b) It should remove the chance that non- controlled factors will influence the results	Because any non-controlled factors wil influence different groups equally, they will not affect results
	c) It should ensure that there is little variation in the plants that are in each group	Because variation is balanced, it is sma within and between groups
	d) It should provide results that are representative of the whole cheatgrass population	Random sampling is the same as randomization; all members of the species will behave the same

Question	Answers	Associated Misconception(s)
2. Which of the following potential hypotheses can be tested in multiple species comparisons/the whole experiment (**i.e. cheatgrass v species A, cheatgrass v species B, cheatgrass v species C and cheatgrass v species D)**? H1: Other species (A, B, C, D) will have no effect on cheatgrass growth rate H2: Other species (A, B, C, D) will have an effect on cheatgrass growth rate H3: Cheatgrass will grow slower when it is in the presence of another species H4: Cheatgrass will grow quicker when it is grown in the presence of some other species	a. Only H1 and H2 b. Either H1 or H2, and either H3 or H4 c. Both H1 and H2, and either H3 or H4 d. H1, H2, H3 and H4	You can only test one null or an alternate hypothesis for any given experiment; you can not test "open-ended" non- specific hypotheses You can not test pairs of null and alternate hypotheses (one or the other) You can only test one "open-ended" hypothesis; you can not test hypothese that do not directly name certain subjects/species (can't say "another" o "some other" species) CORRECT ANSWER – all four can b tested and are appropriate with regard t the research question being asked

Question	Answers	Associated Misconception(s)
3. Which of the following potential hypotheses (H1, H2, H3 and H4) can be tested in a **single** species comparison (**i.e. cheatgrass v species A**)? H1: Species A will have no effect on cheatgrass growth rate H2: Species A will have an effect on cheatgrass growth rate H3: Cheatgrass will grow faster when it is in the presence of Species A H4: Cheatgrass will grow slower when it is in the presence of Species A	a. Only H1 and H2 b. Either H1 or H2, and either H3 or H4 c. Both H1 and H2, and either H3 or H4 d. H1, H2, H3 and H4	You can only test one null and alternat hypothesis for a given experiment You can not test pairs of null and alternate hypotheses (one or the other) You can only test one directional hypothesis – you can not test whether Species A will cause cheatgrass to grov faster as well as slower CORRECT ANSWER – all four can b tested and are appropriate with regard t the research question being asked

Question	Answers	Associated Misconception(s)
4. Which of the following statements correctly describes the link between variation in the different plants (cheatgrass and other species) used in each treatment group and the associated error/inconsistency that will be present in the results?	a. Error/inconsistency is likely to be very low because all plants of the same species are very similar	Individuals within a species are all similar in terms of biological variation
	b. Error/inconsistency will be very low because all plants used in this experiment are of a similar age	Age is the only biological characteristi that will lead to a greatly varied response in individuals
	c. Error/inconsistency could be very high because it is not possible to know all the ways each plant varies	CORRECT ANSWER – biological variation is present in all individuals, can be large, and is hard to measure
	d. Error/inconsistency should not affect the results because all treatment groups will have the same amount of variation	If a source of error affects all treatment groups roughly equally, the results are not biased; all treatment groups will have exactly the same variation due to randomization

Question	Answers	Associated Misconception(s)
5. Carefully read four potential outcomes of your experiment (listed below, 1-4). 1: None of the other 4 species have any effect on cheatgrass growth rate 2: Only 1 other species increases cheatgrass growth rate 3: Only 1 other species decreases cheatgrass growth rate 4: All 4 other species decrease cheatgrass growth rate Which of these outcomes would be **most** useful in terms of advancing knowledge?	a. Outcomes 1 or 4 (more useful than outcomes 2 or 3)	It is more valuable to know that all or nothing makes a difference, than a partial number of species
	b. Outcomes 3 or 4 (more useful than outcomes 1 or 2)	It is more valuable to find one or all species that have the desired effect thai that the opposite is true or there is no impact from any other species
	c. Outcomes 2, 3 or 4 (more useful than outcome 1)	It is more valuable to know that at leas one other species has some effect than to know that none have any affect
	d. Outcomes 1, 2, 3 or 4 (all equal)	CORRECT ANSWER – any of these outcomes will result in new knowledge and as such they will equally advance understanding in this research area

Question	Answers	Associated Misconception(s)
6 [TABLE]. After conducting your experiments, you saw that species B decreased the growth rate of cheatgrass. You now want to know how environmental conditions affect species B, so you can suggest the habitats in which it might best compete with cheatgrass. The table below shows three possible sampling methods/designs that could be used to assess the number of species B plants growing in $10m^2$ plots in different habitats (dry, medium and wet). Which design/designs will give you an unbiased sample size of 25 for each habitat, from which you can calculate an average (mean)?	a. Design A (1, 25)	Pseudoreplication – sampling 25 times from the same habitat/locale does not introduce bias to your data
	b. Design B (5, 5)	Pseudoreplication – sampling 5 times from 5 different habitats/locales does not introduce bias to your data; balance numbers of sites and plots removes bia
	c. Design C (25, 1)	CORRECT ANSWER – 25 different sites/locales are needed for 25 independent samples to be taken
	d. Designs A, B and C	All these methods result in 25 different data points being collected so there is r difference in any of the techniques

Question	Answers	Associated Misconception(s)
7. Previous research suggests cheatgrass might grow faster in wetter environments. To test this in the lab, you **randomly** selected cheatgrass plants to place in one of two treatment groups (one given a normal volume of water, and one given excess water). Complete the following statement to explain the effect of sample size on the suitability of your method: "Randomizing the choice of plants should create similar treatment groups...	a) Most effectively when the number of plants in each group is very small	The chances of selecting highly variabl individuals and creating unbalanced groups is lowest when choosing from a small sample size
	b) Most effectively when the number of plants in each group is very large	CORRECT ANSWER – variation is likely to be split evenly when individuals are chosen from a large sample size
	c) Equally effectively no matter what the number of plants in each group is	Sample size has no effect on the likely split of variation in individuals betwee groups
	d) More effectively than other methods whatever the number of plants in each group is	Randomization will always create mor balanced treatment groups under any scenario (rather than selecting similar individuals, for example)

Question	Answers	Associated Misconception(s)
8. You were given data showing the number of individual plants (cheatgrass and new species E, F, G) growing together in other areas of North America. These data were collected by different research teams working in different habitats. Which of the following options correctly states how these data can be used to advance this field of research?	a. Data were collected in different non- controlled habitats so cannot be used at all	Data were collected in different areas s cannot even suggest potential relationships to test in controlled experiments; cannot be used as they were not collected personally
	b. Data can be used to test hypotheses that ask whether different numbers of these species affect cheatgrass numbers	Correlative patterns in non-controlled (observational) experiments can be use to test hypotheses and attribute cause when considering species interactions
	c. Data can be used to form predictions and hypotheses to test in future experiments	CORRECT ANSWER – this information can be used in terms of a discovery-based experiment; patterns can suggest relationships that can be tested by hypotheses in controlled experiments
	d. Data can be used to test hypotheses that ask whether different habitats affect plant numbers (cheatgrass and other species)?	Correlative patterns in non-controlled (observational) experiments can be use to test hypotheses and attribute cause when considering abiotic variables

Question	Answers	Associated Misconception(s)
9. You then decided to spend time at three new locations in North America and personally collected data for the number of individual plants (cheatgrass and species E, F, G) growing together in these locations. Which of the following options states how these data can be used to advance this field of research?	a. Data were collected in different non- controlled habitats so cannot be used at all	Because these data were collected in different environments, they cannot even suggest potential relationships to test in future, controlled experiments
	b. Data can be used to test hypotheses that ask whether different numbers of these species affect cheatgrass numbers	Correlative patterns in non-controlled (observational) experiments can be use to test hypotheses and attribute cause when considering species interactions
	c. Data can be used to form predictions and hypotheses to test in future experiments	CORRECT ANSWER – this information can be used in terms of a discovery-based experiment; patterns can suggest relationships that can be tested by hypotheses in controlled experiments
	d. Data can be used to test hypotheses that ask whether different habitats affect plant numbers (cheatgrass and other species)?	Correlative patterns in non-controlled (observational) experiments can be use to test hypotheses and attribute cause when considering abiotic variables

Question	Answers	Associated Misconception(s)
10. Previous controlled experiments showed that when farmers add fertilizer A to fields in the amount of 1 ton per hectare (1t/ha), cheatgrass grows approximately twice as fast as when there is none. Farmers are considering increasing fertilizer A to 2t/ha in the hope that not all will be used by cheatgrass and other plants will use the extra fertilizer and grow faster. **You only have access to old fertilizer A. There is a concern that it might no longer work effectively, but you plan your experiment anyway.** You will have three treatment groups: Group 1: Plants given no fertilizer A Group 2: Plants given 1t/ha fertilizer A Group 3: Plants given 2t/ha fertilizer Which of the treatment groups will act as control groups in this experiment?	a. Group 1 only b. Group 2 only c. Group 1 and Group 2 d. Group 1, Group 2 and Group 3	A control can only be a negative contr (removal of the factor being tested) A control can only be a positive contro (include a treatment where the respons is known/can be predicted) CORRECT ANSWER – both negative and positive controls are needed to assess the affect of the third (new) treatment The new treatment can act as a control even though nothing is known about its effect yet

Question	Answers	Associated Misconception(s)
11. Knowing that oxidative damage occurs to some extent in all individuals over time, what is the most useful thing you will be able to do with the results of your comparison?	a. Test the hypothesis that grass sickness is caused by oxidative damage	Student links cause to a correlation or pattern for the group of most interest; only does this for 1 of 2 groups
	b. Test the hypothesis that death in horses is caused by oxidative damage	Student links cause to a correlation or pattern for both treatment groups when other variables could be at work
	c. Develop hypotheses to test which proteins are prone to oxidative damage	CORRECT ANSWER – this is a discovery based study; there are too many variables to infer anything more
	d. Show which proteins are damaged as a result of horses dying from grass sickness	Student does not see a problem in linking cause to a correlation or pattern when talking about specifics, rather than the emergent pattern

Question	Answers	Associated Misconception(s)
12 [TABLE]. There are 3 important decisions to make when deciding how to carry out this experiment (see table below). You want to independently replicate your experiment **4 times** to reduce the likelihood that any conclusions will be biased due to chance or errors. Which of the following versions of your method will achieve this for **each** treatment group (grass sickness and natural causes)?	a) Version a (1, 1, 4)	The final stage of the experimental procedure is the one that needs to be replicated (experimental error important, not bio variation); student not aware that this protocol is pseudoreplication
	b) Version b (2, 2, 1)	"Evening" out replication at different stages is effective; student not aware that this protocol is pseudoreplication
	c) Version c (4, 1, 1)	The sample is the only part of the experimental procedure that needs to b replicated (biological variation important but experimental error not); student not aware that this is pseudoreplication
	d) Version d (4, 4, 4)	CORRECT ANSWER – each stage of an experiment must be wholly replicated

Question	Answers	Associated Misconception(s)
13 [FIGURE]: Below is a gel that your colleague produced. She left lanes 1 and 10 blank. Lanes 2-5 show proteins in a sample from a horse that died of grass sickness, while lanes 6-9 show proteins in a sample from a horse that died of natural causes. Bands only show proteins that suffered oxidative damage, highlighted by the specific fluorescent label. Which of the following samples should be added to the gel (in lanes 1 and 10) to let you assess whether the oxidative damage label is working properly?	a. One each from the horses whose samples are being compared on this gel, but with no oxidative damage labels added	A negative control would tell you whether the fluorescent label was attaching as it should; same sample as that being compared must be used
	b. One each from the horses whose samples are being compared on this gel, with oxidative damage labels added at 200% recommended levels	Doubling the amount of label will confirm if it is attaching as it should; you can assess how well it is working with a sample containing unknown numbers of proteins to which it should attach
	c. One each from unrelated samples with a known number of oxidatively damaged proteins, but with no oxidative damage labels added	A negative control would tell you whether the label was attaching as it should
	d. One each from unrelated samples with a known number of oxidatively damaged proteins, with oxidative damage labels added at recommended levels	CORRECT ANSWER – this positive control will show you whether the labe is attaching to the proteins as it should

Question	Answers	Associated Misconception(s)
14. Imagine that your results highlight a number of proteins that have been damaged oxidatively in both the grass sickness sample and in the death by natural causes sample. The damaged proteins are mostly the same for each sample. What is the most useful thing that you can conclude?	a. Oxidative damage affects specific proteins in the brain neurons of horses	CORRECT ANSWER – a specific pattern can be described but cause can not be attributed to effect
	b. Oxidative damage plays at least a small role in grass sickness	Student links cause to correlation or pattern, favouring positive interpretatic based on the research question
	c. Oxidative damage does not play a significant role in grass sickness	Student links cause to correlation or pattern, favouring negative interpretation based on the research question
	d. Oxidative damage plays at least a small role in the death of horses	Student links cause to correlation or pattern, incorporating both treatment groups (not favouring one over anothe

Question	Answers	Associated Misconception(s)
15 [FIGURE]. Your colleague performed an experiment similar to the one you originally conducted. She sent you a photo of the gel showing oxidatively damaged proteins as bands in the different gel lanes (see below). She thinks her results are consistent with the idea that oxidative damage might play a big role in the death of horses suffering from grass sickness. What should your response be?	a. Agree – there are more bands in samples from horses that died of grass sickness than in samples from horses that died of natural causes	Student does not consider the failure o the negative control; student places no importance in relative size of differences, just that there is a difference
	b. Agree - there are two specific bands that appear in all samples except those taken from horses that died of natural causes	Student does not consider the failure o the negative control to suggest the experiment was contaminated
	c. Disagree – there is a good chance that some of the samples were contaminated and therefore you cannot compare differences	CORRECT ANSWER - bands appear the negative control and thus at least some samples are contaminated
	d. Disagree – only two more specific bands appearing in samples taken from horses that died of grass sickness is not enough to support this idea	Student does not consider the failure o the negative control; student decides arbitrarily that a certain number of differences would be needed to sugges one sample was different from another

Question	Answers	Associated Misconception(s)
16. You now want to compare oxidatively damaged proteins in blood samples (instead of brain neurons). You will compare samples from horses that had recently contracted grass sickness and were at the point of death with those from horses that had suffered broken bone injuries (no nervous system damage) and were also at the point of death. Which of the following methods would **best** reduce the risk of variation between horses affecting any conclusions you draw from your results?	a. Compare samples taken from the same horses before and after they contracted grass sickness or broke a bone	CORRECT ANSWER – before and after comparisons remove most of the biological variation affecting results
	b. Compare multiple samples taken from one representative horse from each group after they contracted grass sickness or broke a bone	Student confuses pseudoreplication wi replicating sufficient samples to come to robust conclusions
	c. Compare samples taken from different horses that were of the same sex after they contracted grass sickness or broke a bone	Student sees sex as the only important biological factor causing variation (eve though age impacts oxidative damage)
	d. Compare samples taken from a very wide variation of different horses (age, sex etc) after they contracted grass sickness or broke a bone	Student confuses the idea of taking a wide sample of individuals to find representative variation in a populatior with the likelihood that this will minimize the effects of variation

Question	Answers	Associated Misconception(s)
17. You isolated one protein (Protein Z) that was damaged oxidatively in the brain neurons and blood samples of all horses that died from grass sickness. You want to see if this protein is more vulnerable to oxidative damage than others (Proteins W, X, and Y) that were sometimes damaged in horse neurons. You will expose these four proteins to reactive oxygen in the lab to seek your answer. You predicted that Protein Z would be more vulnerable to oxidative damage than the other three proteins. There are two potential outcomes to your experiment: Outcome 1: Accept the alternate hypothesis that Protein Z is more vulnerable Outcome 2: Accept the null hypothesis that Protein Z is not more vulnerable Which of these outcomes would allow you to conclude whether or not you could support your prediction?	a. Outcome 1 only	Student believes that accepting a difference is the only way that allows you to support the idea that there is one in reality; believes only the alternate hypothesis can support a conclusion
	b. Outcome 2 only	Student believes that accepting no difference between groups is the only way to conclude whether a prediction was accurate; believes only the null hypothesis can support a conclusion
	c. Neither outcome 1 nor outcome 2	Student does not believe either hypothesis can be used to support a prediction; confuses support with proo
	d. Both outcome 1 and outcome 2	CORRECT ANSWER – both results would allow you to conclude whether o not your prediction was correct (outcome 1 = correct, outcome 2 = incorrect)

Question	Answers	Associated Misconception(s)
18. In the experiment comparing the relative vulnerability of Proteins W, X, Y and Z to oxidative damage by reactive oxygen, the underlying purpose is to collect data:	a) to prove that exposing the protein samples to reactive oxygen has the predicted effect	A positive result proves the existence c a phenomenon/effect AND links this directly to what was predicted (result must be as expected to prove something)
	b) as evidence that most of the protein samples will respond as you predicted	The goal of an experiment is to prove/provide evidence that your prediction was correct (you are not exploring possibilities, instead you are searching for support you are right)
	c) to determine whether you can prove that reactive oxygen has no effect	A negative result proves that the tested factor does not affect the response of the replicate; student confuses burden c proof with meaning a negative result proves the null hypothesis is correct
	d) to suggest whether reactive oxygen has an effect on the protein samples tested	CORRECT ANSWER – your results will not 'prove' anything, but show the effect of a factor on replicates tested in 'this' experiment

Question	Answers	Associated Misconception(s)
19. Researchers discovered that adult mice with very long tails tended to have higher amounts of a certain protein, called “Protein X”, compared to adult mice with normal tails. Which of the following conclusions can be made? Conclusion 1: Protein X must always be present if mice are to grow very long tails Conclusion 2: The amount of Protein X present determines how long a tail grows	a. Neither conclusion 1 nor conclusion 2 can be made	CORRECT ANSWER – these are both merely correlative answers based on th information given
	b. Only conclusion 1 can be made	This is correlative only; student dismisses C2 because it is more detaile than C1
	c. Only conclusion 2 can be made	This is correlative only; student dismisses C1 because it is too specific
	d. Both conclusion 1 and conclusion 2 can be made	Both are correlative; student assumes these to be true based on pre-conceptions

Question	Answers	Associated Misconception(s)
20. Your colleague gives you one mouse with a normal tail and one with a very long tail. What can you say about the relationship between Protein X and these mice when comparing them?	a. The mouse with the normal tail must have low levels of Protein X	It is not possible for an individual at th lower extreme to buck a general trend
	b. The mouse with the normal tail must have low levels of Protein X and the mouse with a very long tail must have higher levels of Protein X	It is not possible for individuals at eith 'extreme' to buck a general trend
	c. The mouse with the normal tail could have high levels of Protein X and the mouse with the very long tail could have lower levels of Protein X	CORRECT ANSWER – There is biological variation present in the mice so these results would not be unexpected
	d. The mouse with the normal tail could have high levels of protein X, but the mouse with the very long tail must have even higher levels of Protein X	It is not possible for individuals at the upper extreme to buck a general trend

Question	Answers	Associated Misconception(s)
21. A competing lab also wants to discover what causes some mice to grow longer tails but takes a different approach to yours. Your lab decided to manipulate the amount of Protein X found in young mice, keep them in identical conditions, and then compare tail lengths. The competing lab uses data from a large database showing the relative amounts of **all** proteins in mice. Researchers from the competing lab compare patterns in these data for mice with very long tails and mice with normal ones to look for any large differences. Which of the following statements provides an accurate comparison of the conclusions that can be made by the competing lab and yours?	a. The competing lab can conclude whether the amount of Protein X present affects tail length, but yours cannot	A discovery-based experiment can attribute causation, AND a controlled hypothesis- testing one can only sugge a correlation
	b. The competing lab cannot conclude whether the amount of Protein X present affects tail length, but yours can	CORRECT ANSWER – your experiment is a controlled hypothesis-testing one, theirs is only discovery-based/correlative
	c. Both the competing lab and your lab can conclude whether the amount of Protein X present affects tail length	A discovery-based experiment can attribute causation to a correlative resu
	d. Neither the competing lab nor your lab can conclude whether the amount of Protein X present affects tail length	A controlled hypothesis-testing experiment is unable to attribute causation to a trend/correlation

Question	Answers	Associated Misconception(s)
22. A colleague performed a series of experiments in rats (a species that is very closely related to mice). This colleague found that a protein called "Protein Y" directly caused rats to grow very long tails, but Protein Y was only present if these rats also had high levels of Protein X. If you were to test whether tail length in mice is determined in the same way as it is in rats, which of the following pairs of hypotheses should you test? Pair 1: 'Protein X has no direct effect on tail length in mice', and 'Protein X has a direct effect on tail length in mice' Pair 2: 'Protein Y' has no direct effect on tail length in mice', and 'Protein Y' has a direct effect on tail length in mice' Pair 3: 'Protein X has no direct effect on Protein Y', and 'Protein X has a direct effect on Protein Y'	a. Only Pair 3 b. Only Pairs 1 and 2 c. Either pairs 1 and 3, or pairs 2 and 3 d. Pairs 1, 2 and 3	Testing the final element of the experiment/study with hypotheses will let you answer the research question; it is only appropriate to test 1 pair for 1 experiment Testing the first two elements of the study will let you assume the outcome of the third, so there is no need to test i it is not appropriate to test >2 pairs per experiment Testing the final element of the study i more important than one of the intermediate elements, which can be assumed by results from the other two hypothesis tests; it is not appropriate tc test >2 pairs per experiment CORRECT ANSWER – you must tes a pair of hypotheses for each element c the experiment (does Protein X affect tail length, does Protein Y affect it, anc do they affect each other?)

Question	Answers	Associated Misconception(s)
23. Imagine that you discovered there was not enough evidence to support a direct, causal relationship between Protein X and increased tail length in mice. How should you report the results of your experiment?	a. The experiment was a failure because it did not show which factors affect tail length in mice	An experiment is only a success if it supports a theory or explains why a phenomenon exists
	b. The experiment was a failure because it did not show which factors affect tail length in mice, but it was also a success because it improved methodology	An experiment is only a success in a broad sense if it supports a theory or explains why a phenomenon exists, bu improving methodology saves it from failure
	c. The experiment was a success because it showed other factors must directly control growth of mice tails	Results cannot possibly be random and/or the variable you are measuring must be directly controlled by other variables (it could not possibly vary by chance)
	d. The experiment was a success because it showed Protein X does not affect tail length in mice	CORRECT ANSWER – this is new knowledge and is therefore a successfu test of your original hypothesis

Question	Answers	Associated Misconception(s)
24. In another experiment, you assessed whether a new drug was successful in increasing tail length. You tested a null hypothesis (tail length would not be affected by the drug) and an alternate hypothesis (tail length would be affected by the drug). You predicted that mice given the drug would grow longer tails than those in the other group, which were given a placebo (a pill known not to affect tail length). Which of the following things would need to happen at the end of this experiment for it to be considered a success?	a. You would be able to conclude whether tail length was affected by the drug	CORRECT ANSWER – a result (negative or positive) that allows a test the hypothesis makes the experiment a success
	b. You would be able to reject the null hypothesis	Only a positive result (the treatment ha an effect) indicates a success
	c. You would be able to accept your prediction was correct	Only a result that proves your subjectiv prediction correct indicates a success
	d. All three of the above would need to happen (answers, a, b, and c)	You need a result that tests the hypothesis, must achieve a positive res (the treatment had an effect), and the result must support your prior predictic for it to be a successful experiment.

Question	Answers	Associated Misconception(s)
25. After four months, you calculated average (mean) tail length and the variation around the averages for both groups in your experiment. You found that mice in the group given the drug designed to increase tail lengths did indeed grow significantly longer tails than those given the pill known not to affect tail length. However, some of these mice showed much greater tail growth than others. Can you be certain that these differences were due to individual mice varying in certain biological characteristics, such as age, sex and health?	a. Yes – because there was a significant difference between groups you know the method and equipment is very reliable b. Yes – because you know the drug had a significant effect it can only have been biological differences that led to variation in tail lengths c. No – because if some mice grew longer tails than others in the same treatment group the drug might not have had an effect d. No – because human errors and faulty equipment could have impacted the differences in tail lengths seen in individual mice	A significant difference can only be found if the method is reliable and doe not yield much experimental error Biological variation would affect assessment of the effect of a treatment but no other source of error would if there is a significant result If individuals respond differently, it is not possible to attribute a factor as having a significant effect CORRECT ANSWER – human error(s could also have been responsible for some of the observed differences

Question	Answers	Associated Misconception(s)
26. Out of the 50 mice in the group given the drug, 5 of them barely grew longer tails at all. What should you do to seek further support for your belief that there is a direct link between the drug and mice growing longer tails?	a. Give the 5 mice that barely grew longer tails another dose of the drug to see whether they now grow longer tails	Pseudoreplication; if a result was unexpected or anomalous, you should just repeat the treatment on that subjec
	b. Give the 45 mice that did grow much longer tails another dose of it to see whether they grow longer tails again	Pseudoreplication; repeating a treatme should cause a similar response as the first time
	c. Give all 100 mice the opposite doses to before (if they had the drug before they will now have the pill known to have no effect) to see if the results are the opposite	Pseudoreplication; reversing treatment should result in the opposite effects be seen; if all individuals are re-tested the is no bias/pseudoreplication
	d. Start again with 100 mice that have never been tested before, split 50 into each group and see whether results are similar to the first experiment	CORRECT ANSWER – replicate the entire experiment again with new individuals to seek further support

Question	Answers	Associated Misconception(s)
27. There are many potential sources of error that could bias your results in any experiment, such as biological variation or other factors not being kept constant between different treatment groups. Which of the following statements describes the consistency with which sources of error affect experiments when they are repeated for a second time (trial)?	a. The source of error that affected the first trial more than other sources will also affect the second one more than other sources	Sources of error are individually predictable in the effect that they will exert from trial to trial
	b. The source of error that most affected the first trial will also affect the second one but to a lesser degree	Sources of error are predictable in the extent of the effect they will exert from trial to trial; increased experience of a method always reduces error
	c. A source of error that affected the first trial in a major way will affect the second one in a major way	Sources of error are predictable in term of the extent of the effect they will exe from trial to trial
	d. A source of error that affected the first trial in a minor way could affect the second one in a major way	CORRECT ANSWER – sources of err are dynamic and can affect different tri in different ways/amounts