

# ENVIRONMENTAL SCIENCE

## Units 3 & 4 – Written examination



## 2024 Trial Examination

### SOLUTIONS

#### SECTION A: Multiple-choice questions (1 mark each)

##### Question 1

*Answer:* D

*Explanation:*

All other options have at least one non- renewable resource.

##### Question 2

*Answer:* A

*Explanation:*

All other options are renewable fuels.

##### Question 3

*Answer:* B

*Explanation:*

This option aligns with the definition of the user pays principle in the study design.

**Question 4**

*Answer:* D

*Explanation:*

The other energy transfer diagrams are for other energy sources.

**Question 5**

*Answer:* C

*Explanation:*

CITES convention is responsible for maintaining a list of endangered animals and monitoring the trade of these species. They will also issue fines and legal action if required.

**Question 6**

*Answer:* B

*Explanation:*

Options A, C and D are all consequences but do not impact the population size considering genetic diversity.

**Question 7**

*Answer:* C

*Explanation:*

Risk assessments do not remove risk, they identify it.

**Question 8**

*Answer:* C

*Explanation:*

All other options are incorrect.

**Question 9**

*Answer:* B

*Explanation:*

The greenhouse effect is responsible for our consistent liveable temperature.

**Question 10**

*Answer:* C

*Explanation:*

Options A, B and D are all incorrect.

**Question 11**

*Answer:* C

*Explanation:*

Option A and B do not increase ecosystem stability. Option D is a nonsense answer. The ability to adapt is important for ecosystem stability.

**Question 12**

*Answer:* C

*Explanation:*

Option B is incorrect as inbreeding decreases genetic variability. Option D is incorrect as it effects genetic diversity.

**Question 13**

*Answer:* A

*Explanation:*

Pioneer species are the most important plant species when rehabilitating a mine site.

**Question 14**

*Answer:* B

*Explanation:*

This is the definition of mass extinction.

**Question 15**

*Answer:* C

*Explanation:*

All other options are incorrect.

**Question 16**

*Answer:* B

*Explanation:*

Percentage Increase= $((25-20)/20) \times 100 = (5/20) \times 100 = 0.25 \times 100 = 25\%$

**Question 17**

*Answer:* B

*Explanation:*

$N = (50 \times 100) / 20 = 5000 / 20 = 250$

**Question 18**

*Answer:* C

*Explanation:*

Option A is regulating services. Option B is not an ecosystem service. Option D is cultural services.

**Question 19**

*Answer:* D

*Explanation:*

All of the options are correct.

**Question 20**

*Answer:* D

*Explanation:*

By exhausting the known sources of oil we will reach the peak quicker.

**Question 21**

*Answer:* C

*Explanation:*

Geothermal energy uses the energy from the tectonic plate movement.

**Question 22**

*Answer:* B

*Explanation:*

All other options are not advantages,

**Question 23**

*Answer:* C

*Explanation:*

Intergenerational equity is all about making sure that there are resources for the current generation whilst maintaining resources for future generations.

**Question 24**

*Answer:* C

*Explanation:*

All other options are incorrect.

**Question 25**

*Answer:* C

*Explanation:*

A hypothesis is a predicted outcome not a rationale, method, or data.

**Question 26**

*Answer:* B

*Explanation:*

Option B defines both accuracy and precision.

**Question 27**

*Answer:* A

*Explanation:*

Option B is an unclear statement. Options C and D are both incorrect.

**Question 28**

*Answer:* C

*Explanation:*

Percentage Increase= $((1.8-1.2)/1.2) \times 100 = (0.6/1.2) \times 100 = 0.5 \times 100 = 50\%$

**Question 29**

*Answer:* B

*Explanation:*

Option A is quantitative data. Options C and D are both incorrect.

**Question 30**

*Answer:* C

*Explanation:*

Historical data is used so that trends in data can be highlighted.

**SECTION B: Short-answer questions**

**Question 1** (17 marks)

a. 2 marks for any two of the following advantages:

- i. Decreases predation
- ii. Increases habitat
- iii. Increases access to food
- iv. Decreases disease
- v. Decreases competition

2 marks for clearly explaining why it is an advantage.

b. 2 marks for any two of the following disadvantages:

- i. Decreases territories
- ii. Increases inbreeding
- iii. Decreases ability to live in wild

2 marks for clearly explaining why it is a disadvantage.

c. By restoring the habitat, the possum would increase in population size due to increased habitat, and availability of resources, and have an increased resilience to environmental change due to increased gene flow. 2 marks

d. Any reasonable limitation 1 mark each

e. Any reasonable management strategy 1 mark

Description of how it addresses the issues 2 marks

*Example:*

*Installing a wildlife corridor that goes around the farms. This would ensure that the possums stay away from the fences reducing the impact and danger.*

f. An endemic organism is one that is native and restricted to one area. 1 mark.

Endemic organisms are important for ecosystem diversity as they can be used as indicators for the health of the ecosystem. 1 mark.

**Question 2** (11 marks)**a.**

Species recorded at site A	$n_i$	$n_i - 1$	$n_i (n_i - 1)$
Blue tongue Lizard	2	1	2
Magpie	26	25	650
Brown Snake	1	0	0
Bandicoot	90	89	8010
Emu	56	55	3080
Kangaroo	160	159	25440
Rabbit	900	899	809100
<b>N =</b>	<b>1235</b>		$\sum[n_i (n_i - 1)] =$ <b>846282</b>
<b><math>N(N - 1) =</math></b>	<b>1523990</b>		

$$D = 1 - \frac{\sum[n_i (n_i - 1)]}{N(N - 1)}$$

$$D = 1 - \frac{846282}{1523990}$$

$$D = 1 - 0.55$$

$$D = 0.445$$

*Teacher Note: Award 3 marks for correct calculations, correct table entries and correct final answer. Award 2 marks for correct table entries and significant progress in the calculation (including minor errors resulting in an incorrect final answer). Award 1 mark for some correct table entries and calculations.*



b.

Species recorded at site A	$n_i$	$n_i - 1$	$n_i (n_i - 1)$
Blue tongue Lizard	4	3	12
Magpie	90	89	8010
Brown Snake	8	7	56
Bandicoot	200	199	39800
Emu	6	5	30
Kangaroo	250	249	62250
Rabbit	0	0	0
<b>N =</b>	<b>558</b>		$\sum[n_i (n_i - 1)] =$ <b>110158</b>
<b><math>N(N - 1) =</math></b>	<b>310806</b>		

$$D = 1 - \frac{\sum[n_i (n_i - 1)]}{N(N - 1)}$$

$$D = 1 - \frac{110158}{310806}$$

$$D = 1 - 0.35$$

$$D = 0.646$$

*Teacher Note: Award 3 marks for correct calculations, correct table entries and correct final answer. Award 2 marks for correct table entries and significant progress in the calculation (including minor errors resulting in an incorrect final answer). Award 1 mark for some correct table entries and calculations.*

**c.** *Teacher note: 1 mark for stating site, 1 mark for explanation/ justification using index values. Based on correct calculation of Simpson's Index the answer above should apply. If calculation in part a. results in incorrect answer, can award full marks for the correct statement based on calculated results.*

**Example:**

Species diversity is defined as the as the number of different species present in a place and relative abundance of each of those species. 1 mark

Site B has a higher species diversity, with an index number of 0.646 than Site A with an index number of 0.445. 1 mark

- d. Site A has a larger richness. 1 mark  
 Site A has 7 species present, whereas Site B has only 6 species present. 1 mark
  - e. One of the following options or any other reasonable idea. 1 mark
    - Mark and recapture
    - Direct observation
    - Indirect sampling
- Limitation 1 mark  
 Benefit 1 mark
- f. The presence of the rabbit as the invasive species at Site A has decreased the biodiversity when compared to Site B. This is evident though the index numbers 0.44 for Site A and 0.64 for Site B. 2 marks

**Question 3 (16 marks)**

- a. Any 3 renewable sources for 1 mark each
- b. Answers will vary depending on what the students chose for part a.

Example:

Energy sources that students could have chosen	Advantage	Disadvantage
Geothermal	1 Not weather dependent	1 Location dependent
Hydroelectrical	2 No greenhouse gases released	2 Location dependent
Wind	3 no greenhouse gases emitted	3 Dangerous to flying wildlife

- c. In Australia solar would be the most relevant energy source 1 mark  
 Australia has a lot of sun 1 mark  
 Would need to be installed with batteries to account for intermittence. 1 mark
- d. Answers will vary depending on the energy source chosen by students. 2 marks  
 Limitations 2 marks  
 Ways to overcome limitations

**Question 4** (19 marks)

**a.** *Teacher note: accept*

- *appropriate and relevant discussion of the change in the town meeting the needs of current and future generations (intergenerational equity) for 1 mark*
- *appropriate and relevant discussion of the change in the town not meeting the needs of current and future generations (intergenerational equity) for 1 mark*
- *appropriate and relevant discussion of the change in the town protecting the environment (conservation of biodiversity and ecological integrity) for 1 mark and*
- *appropriate and relevant discussion of the change in the town not protecting the environment (conservation of biodiversity and ecological integrity) for 1 mark*
- *Clear argument of which proposal is more ecologically sustainable 1 mark*

**b.** *Teacher note:*

*Accept any 2 relevant stakeholders for 2 marks*

- c.** Clear description of why they would want the development, or otherwise be against the development for 2 marks.
- d.** Increasing habitat will increase biodiversity. 1 mark  
 This is done by increasing nesting sites, safety from predation and food sources. 1 mark
- e.** Some appropriate examples are:

<b>Sphere</b>	<b>Predicted effect from oil rig</b>	<b>Predicted effect from solar panel</b>
Lithosphere	Erosion	Less disruption to the soil
Biosphere	Habitat destruction	Less damage to the marine ecosystems
Atmosphere	Increased carbon dioxide released	Less release of carbon dioxide as there will be no burning off
Hydrosphere	Increased water pollution	Less chance of water pollution.

**Question 5** (8 marks)

View	Justification
Anthropocentrism	The development of the amazon rainforest would benefit humankind as it would provide income, jobs, and recreational avenues.
Biocentrism	By developing the amazon rainforest humans can provide for themselves whilst also looking after the local environment. This would ensure that all organisms are benefiting from the development.
Ecocentrism	By developing the Amazon rainforest, the company would be able to ensure that the rare species of plants can be protected.
Technocentrism	The development of the Amazon rainforest would allow for the use to technology to best fight the challenge of overgrowth and wildfire chances.

**Question 6** (15 marks)

- a. Any two methods studied for 2 marks.  
This could include satellite measurements of ice, global temperature readings, paleobotany, or sea level rise.
- b. Ice cores contain trapped air bubbles which can be analysed to reconstruct atmospheric conditions (1 mark), the layers can be analysed to determine snow fall in the past, and dust and aerosols can be analysed (1 mark). Together this information can be used to determine past climate conditions, and the rate of change, and compare to present climate (1 mark)
- c. Answers will vary depending on what the students choose.  
1 mark for each limitations provided.
- d. Thermal expansion and melting of land ice. 2 marks  
Thermal expansion occurs when water molecules take in energy and expand increasing the volume of sea water. 1 mark  
Melting land ice adds to the overall sea level as it was never there in the beginning. 1 mark
- e. Sea level rise demonstrates the global temperature 1 mark  
A fast sea level rise indicates a quickly warming climate. 1 mark
- f. Albedo is a measure of the reflectivity of a surface. 1 mark  
High reflectivity results in lower temperatures 1 mark