Markscheme

1 The term 'species' doesn't necessarily apply to all living organisms:

- organisms that reproduce asexually don't fit as they don't interbreed - instead DNA differences are used
- fossil species - defined by age, differences in anatomy and where they are formed

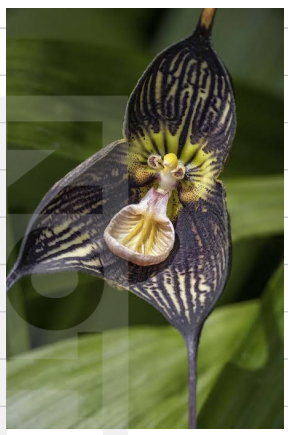
Biological species concept: species are groups of actually or potentially interbreeding natural populations that are reproductively isolated from other such groups
↳ is it meaningful that two species can interbreed if they never naturally would meet?
↳ many different species have interbred in captivity - do hybrids negate this?

Ecological species concept: a species is a set of organisms adapted to a particular set of resources in the environment

Genetics species concept: genetically compatible interbreeding natural populations that are genetically isolated from other such groups

2

	Animal	Plant
Domain	Eukaryota	Eukaryota
Kingdom	Animalia	Plantae
Phylum	Chordata	Magnoliophyta
Class	Mammalia	Liliopsida
Order	Primates	Asparagales
Family	Hominidae	Orchidaceae
Genus	Homo	Dracula
species	Homo sapiens	Dracula vampira



3 Many possible answers.

1- Does not have spots on its fur... 2
Has spots on its fur..... 4

2- Has stripes on its fur..... Panthera tigris
Does not have stripes..... 3

3- The tip of tail has black tuft of hair.... Panthera leo
The tip of tail does not have black tuft of hair... Puma concolor

4- Spots are not grouped... Acinonyx jubatus
Spots are grouped... 5

5- Grouped spots form a ring with spot in center
..... Panthera onca
Grouped spots do not form a ring with center spot
..... Panthera pardus

4 a)

- Does it have a cell wall?
  - no → Animal
  - yes → Does it have a nucleus?
    - no → Prokaryote
    - yes → Is it only unicellular?
      - yes → Protoctist
      - no → * many possibilities ↓
- Is it autotrophic?
  - yes → Plant
  - no → Fungus

b)

- Does it have feathers?
  - yes → Bird
  - no → Does it have gills?
    - yes → Fish
    - no → Does it use internal fertilization?
      - yes → Mammals
      - no → Is body covered in scales
        - yes → Reptiles
        - no → Amphibians

c)

- Does it have more than 1 pair of eyes?
  - yes → Arachnids
  - no → Does it have compound eyes?
    - no → Myriapods
    - yes → Does it have 2 pairs of antennae?
      - no → Insects
      - yes → Crustacea

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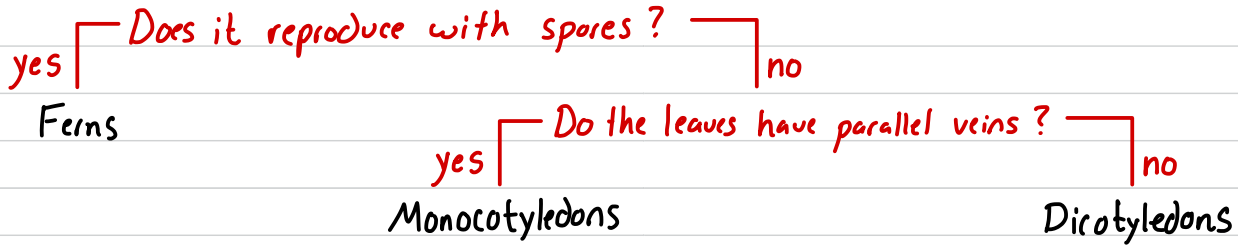
d)



5 a) 28 million years ago

b) Spectacled, sloth, Sun, Black, Polar, Brown bears

c) Polar bear

d) Giant Panda and Polar bear because they share a more recent common ancestor (20mya) compared to the others (35 mya)

6 Antibiotics target specific structures (like cell walls) or bacterial enzymes and metabolic processes. Viruses lack a cell wall and do not metabolize. They are only composed of a capsid and genetic material thus are unaffected by antibiotics

7 a) Shark - largest number of amino acids in order
→ only 1 DNA base different

b) Cat and Kangaroo have largest amino acids in order but Kangaroo have most DNA bases the same ∴ Kangaroo

Shark	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-ARG-LEU-LEU-ARG DNA Sequence: CTTATCCCCCCGTTTATCCTACTTTCCCGTCTACTTCGT
Dolphin	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-HIS-VAL-VAL-SER DNA Sequence: CTAATCCCCCCGTTTATCCTACTTTCCCATGTAGTAAGT
Lizard	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-ARG-LEU-LEU-ARG DNA Sequence: CTAATCCCCCCGTTTATCCTACTTTCCCGTCTACTTCGT

Kangaroo	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-HIS-LEU-LEU-SER DNA Sequence: CTAATCCCCCCGTTTATCCTACTTTCCCATCTACTAAGT
Earthworm	Amino Acid Sequence: LEU-ISO-ASP-PRO-PHE-ILE-LEU-HIS-SER-ARG-LEU-LEU-ARG DNA Sequence: CTTATCGACCCGTTTATCCTACATTCCCGTCTACCTTCGT
Cat	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-HIS-LEU-LEU-SER DNA Sequence: TTAATCCCCCCGTTTATCCTACTTTCCCATCTACTAAGT
Shark	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-ARG-LEU-LEU-ARG DNA Sequence: CTTATCCCCCCGTTTATCCTACTTTCCCGTCTACTTCGT
Dolphin	Amino Acid Sequence: LEU-ISO-PRO-PRO-PHE-ILE-LEU-LEU-SER-HIS-VAL-VAL-SER DNA Sequence: CTAATCCCCCCGTTTATCCTACTTTCCCATGTAGTAAGT

8 Birds - both are internal fertilizers, endothermic, body covering made of keratin and lungs.

the hypothesized evolutionary history is: