Biology problem set -2

Contact ravilakna96@gmail.com if you want to discuss answers.

Animal anatomy and physiology

1.Given below are data on the breathing rate, heart rate and body temperature of four different mammals, A to D.

Animals	Breathing rate (inhalations/min)	Heart rate (beats/min)	Body temperature (°C)
A	160	500	36.5
B	15	40	37.2
C	28	190	38.2
D	8	28	35.9

1.1. Rank Animals A to D in descending order for surface area per unit volume of the body

1.2. Rank Animals A to D in descending order for total volume of blood in the body.

Genetics

2.Chicken with short wings and legs are called “creepers”. When creepers are mated with normal birds they produce creepers and normal chickens with equal frequency.. When creepers are mated with creepers they produce two creepers to one normal. Crossing between normal birds produce only normal progeny.

2.1. What is the simplest genetic basis for creepers and normal chicken? Indicate the correct answer(s) with a tick (✓) and incorrect answer(s) with a cross (✗).

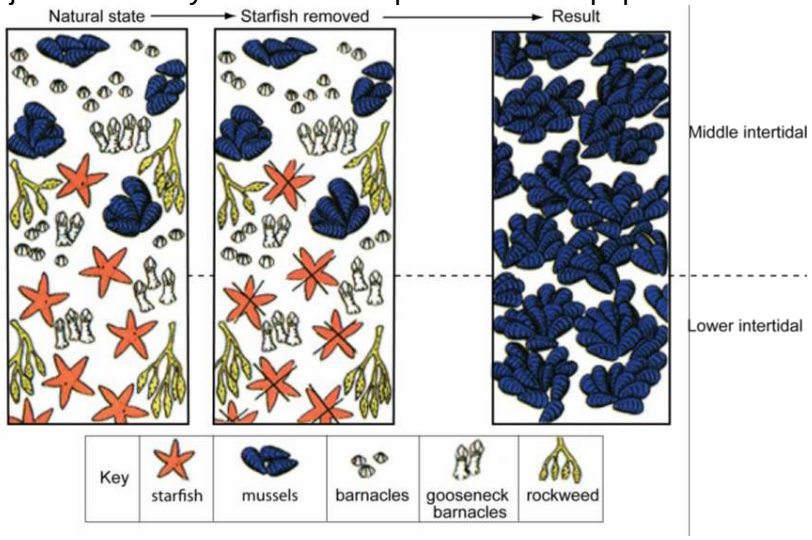
	Homozygous dominant	Heterozygous	Homozygous recessive
Normal			
Creepers			

2.2. Indicate the correct phenotype of chickens carrying two creeper alleles with a tick (✓) and incorrect phenotypes with a cross (✗).

Normal	Short wings	Short legs	Short wings and legs	Lethal

Ecology

3.The schematic figure below shows a simulation of a marine community done with the objective to study the relationships between its populations.



Starfish – Asteroidea; Mussels – Lamellibranchia; Barnacles – Cirripedia;
Gooseneck barnacles – Cirripedia; Rockweed – Phaeophyta.

Based on the above figure, indicate correct statement(s) with a tick (✓) and incorrect statement(s) with a cross (✗).

a. The community, in its natural state, includes four species of the Kingdom Animalia.
b. All the animals of this community have three germ layers and are deuterostomates.
c. Phyla of animals represented here are Echinodermata, Mollusca and Arthropoda.
d. In their natural environment, starfish is a keystone species
e. In their natural environment, mussel density is larger in the middle intertidal zone than in the lower intertidal zone because starfish live in the lower intertidal zone.
f. At the end of the study, the community collapses and only one population increases its ecological niche.
g. The competitive exclusion of the other populations by the mussels was demonstrated.
h. Mussels occupy the fundamental niche including both the middle intertidal zone and lower intertidal zone.
i. Natural conditions include biotic interactions like inter-specific competition and predation.

Microbiology

Four mixtures of microorganisms were collected from different sites around a school and each microbial mixture was inoculated into a medium that contained all essential elements (in the form of ionic compounds) except carbon. The medium was at first clear (i.e., not turbid), and n

this was left to be cultured with agitation in the dark for 24 h (Stage I). The culture was subsequently continued in bright light for 24 h (Stage II) and then a further 24 h in the dark (Stage III). The turbidity of the four samples was monitored at the end of each stage and the following results were obtained.

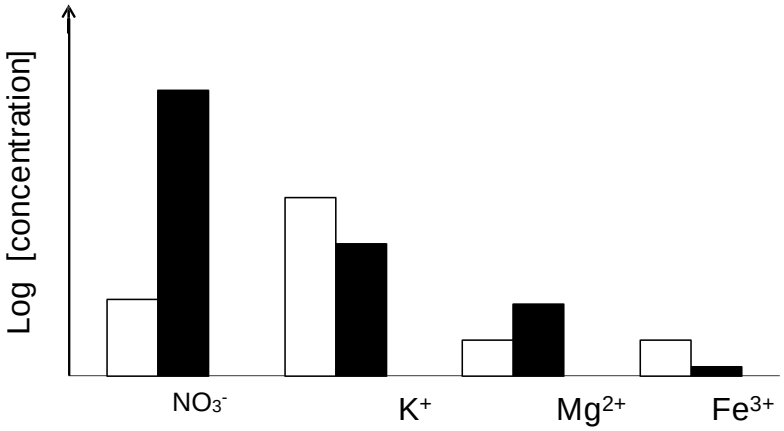
Sample	End of Stage		
	I	II	III
1	Clear	Clear	Clear
2	Clear	Slightly turbid	slightly turbid
3	Slightly turbid	More turbid	Very turbid
4	Slightly turbid	slightly turbid	Slightly turbid

Which of the following organisms (a-d) are likely to be present in samples 1 to 4? Use a tick (✓) to indicate presence and a cross (✗) to indicate absence **.**

a. photoautotrophic microorganisms
b. chemo-organotrophic microorganisms
c. microorganisms that carry cellular storage granules such as inclusion bodies
d. microorganisms that carry thylakoid membranes in their cells

Plant anatomy and physiology

5. The bar chart shows the concentrations of various minerals in the nutrient solution (☐) and in the root cells (■) after 2 weeks of plant growth. Based on the graph given below, indicate appropriate answer(s) with a tick (✓) and inappropriate ones with a cross (✗)



Nutrient	Required as trace element	Absorbed by passive transport
NO_3^-		
K^+		
Mg^{2+}		

Fe^{3+}		