

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. Name the gas exploited by Biogas project in Bhutan to be used in household cooking:
 - a) Butane
 - b) Methane
 - c) Ethane
 - d) Carbon dioxide

2. Brown egg layer chicken popularly reared in Bhutan:
 - a) White leghorn
 - b) Hyline
 - c) Rhode Island Red
 - d) Plymouth Rock

3. Exotic bee species popularly reared in Bhutan:
 - a) Apis cerena
 - b) Apis dorsata
 - c) Apis laborisa
 - d) Apis mellifera

4. Broad leaf fodder tree abundantly found in tropical and subtropical areas:
 - a) Willow
 - b) Ficus
 - c) Oak
 - d) Pine

5. Average length of estrus cycle in a cow:
 - a) 19 days
 - b) 21 days
 - c) 23 days
 - d) 25 days

6. Average length of gestation in a sow:
 - a) 115 days
 - b) 117 days
 - c) 119 days
 - d) 121 days

7. Range of chicken egg hatching:
 - a) 17-18 days
 - b) 18-19 days
 - c) 19-20 days
 - d) 20-21 days

8. Exotic cold water fish species introduced in Bhutanese river system:
 - a) Carp
 - b) Barramundi
 - c) Trout
 - d) Salmon

9. Intermediate host of Fasciola parasite:
 - a) Fly
 - b) Beetle
 - c) Snail
 - d) Bees

10. Marek's disease vaccination age in chicken:
 - a) 0 day old
 - b) 3 days old
 - c) 6 days old
 - d) 9 days old

11. A typical example of transboundary animal disease:
 - a) Black quarter
 - b) Glander
 - c) Strangle
 - d) Foot and Mouth Disease

12. Hormone responsible for cows coming in heat:
 - a) Oxytocin
 - b) Progesterone
 - c) Estrogen
 - d) Prolactin

13. Hormone responsible for milk let down:
 - a) Oxytocin
 - b) Progesterone
 - c) Estrogen
 - d) Prolactin

14. Existing Livestock Act of Bhutan is of year:
 - a) 2019
 - b) 2001
 - c) 2003
 - d) 2005

15. Existing Livestock Rules and Regulations is of year:
 - a) 2016
 - b) 2017
 - c) 2018
 - d) 2019

16. Select the year of first outbreak of Bird Flu (H5N1) in Bhutan.
- 2008
 - 2010
 - 2012
 - 2014
17. Which of the following poultry rearing system is not practised in Bhutan?
- Battery cage
 - Free range
 - Intensive
 - Extensive
18. Range of weaning age of piglets:
- 25-30 days
 - 30-35 days
 - 35-40 days
 - 40-45 days
19. Choice of fluid in the treatment of milk fever in a cow:
- Dextrose-5
 - Normal saline
 - Calcium borogluconate
 - Ringer lactate
20. Bhutan is self-sufficient in which of the following livestock produce?
- Pork
 - Milk
 - Egg
 - Honey
21. What is the temperature and time for regular HTST pasteurization of milk?
- 138°C for 2 sec
 - 72°C for 15 sec
 - 115°C for 20 min
 - 63°C for 30 min
22. The method of crossing two different breeds that have complimentary traits to produce a hybrid progeny is called:
- Inbreeding
 - Cross breeding
 - Outbreeding
 - Back-crossing
23. Which of the following criteria are used for evaluation of semen?
- Motility
 - Volume
 - Concentration
 - All of the above

24. Which of the following is a compound stomach animal?
- Cow
 - Horse
 - Dog
 - Cat
25. In Bhutan, horse breeding with Haflinger breed was discontinued from late 1990s and subsequently the Department of Livestock introduced mountain pony breed of horse. Select the introduced breed:
- Jhanskari
 - Shetland
 - Spiti
 - Thoroughbred
26. Correct order of compound stomach (anterior to posterior):
- Omasum, rumen, reticulum and abomasum
 - Rumen, reticulum, omasum and abomasum
 - Rumen, omasum, reticulum and abomasum
 - Abomasum, omasum, reticulum and rumen
27. Which one of the following poultry vaccinations is not practised in Bhutan?
- Infectious bursal disease
 - Avian Influenza
 - Newcastle disease
 - Marek's Disease
28. Currently used FMD vaccine in Bhutan contains:
- Serotype A, O, C
 - Serotype A, O Asia-1
 - Serotype A, O
 - Serotype O, Asia-1
29. Choice of drug for the treatment of Fasciola:
- Triclabendazole
 - Piperazine
 - Praziquantel
 - Oxyclozanide
30. Final host of *Taenia solium*:
- Human
 - Pig
 - Dog
 - Cat

PART II – Short Answer Questions [20 marks]

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks. Mark for each sub-question is indicated in the brackets.

1. Name the improved temperate pasture seed mixture and briefly describe two winter fodder conservation methods. **(5 marks)**
2. Write the extended of:
 - a) CNVR and which animal is used for this protocol **(2 marks)**
 - b) NADPM & RCP who coordinates this program **(3 marks)**
3. What is the Jersey blood level in a progeny?
 - a) Born out of 50% Jersey cow and 75% Jersey bull? **(2 marks)**
 - b) Born out of 75% Jersey cow and 75% Nublang bull **(3 marks)**
4. Write the extended form of the following: **(5 marks)**
 - a) Disease - ASF
 - b) Milk component - SNF
 - c) Nutrient - CP
 - d) Vaccine - ARV
 - e) Hormone - PG

SECTION B: CASE STUDY [50 marks]

Choose either Case I or Case II from this Section. Each case carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

The COVID-19 pandemic has tested the economic resilience of almost all countries in the whole world in one or other ways. Bhutan is no exception in this testing. Country significantly exhausted its financial reserve in responding to COVID-19 pandemic. Livestock sector is one of the few sectors that has shown an increased GDP contribution during these difficult times. During this period many farmers realized the potentials of livestock farming as a safety net for such difficult times and started piggery and poultry enterprises. This indicates that livestock farming is one of the most resilient sectors in supporting circular economy. As an Animal Science graduate and employed in these sectors, how would you support farmers in building stronger rural economy? Answer the following questions in this context.

1. Describe running a piggery farm with 200 fatteners, one cycle: rearing, slaughtering and selling pork. Assume housing is available on full subsidy from government. **(10 marks)**
2. Where would be your potential market for pork in Bhutan? **(5 marks)**
3. Describe running a broiler farm with 2000 broilers, one cycle: rearing, slaughtering and selling chicken. Assume housing is available on full subsidy from government. **(10 marks)**
4. Where would be your potential market for chicken in Bhutan? **(5 marks)**
5. Describe how your business will help circular economy in Bhutan. **(10 marks)**
6. If you have to export your products (pork and chicken), where would be your market? Describe the export process and revenue generation. **(10 marks)**

CASE II

Department of Livestock has three different Divisions viz: a) Livestock Production Division; b) Research and Extension Division and; c) Animal Health Division. All these three Divisions work in close collaboration. There are several agencies under each Division such as Farms, Programs and Centres with specific mandates of their own. All these agencies work towards achieving overall goal of the Department of Livestock. Additionally, Department of Livestock also works in close collaboration with other agencies such as National Biodiversity Centre (animal gene bank and biodiversity) and Bhutan Livestock Development Corporation Ltd (livestock product diversification and value addition). Answer the following questions:

1. What are the mandates of:
 - a) National Dairy Research and Development Centre, Yusipang? **(5 marks)**
 - b) National Poultry Research and Development Centre, Sarpang? **(5 marks)**
 - c) National Pig Research and Development Centre, Gelephu? **(5 marks)**
2. Describe at least one major research component taken up in each of the above three Centres. **(10 marks)**
3. Name the followings: **(5x1=5 marks)**
 - a) The Farm where native cattle are reared.
 - b) The Farm where native chickens are reared.
 - c) The Farm where native pigs are reared.
 - d) The Farm where mithuns are reared.
 - e) The Farm where Spiti horses are reared.
4. What are the mandates of National Centre for Animal Health, Serbithang? Mention some of the research components the Centre takes up. **(10 marks).**
5. Describe the role of National Biodiversity Centre in the context of animal science. **(5 marks)**
6. Describe the role of Bhutan Livestock Development Corporation Ltd in terms of livestock products. **(5 marks)**

TASHI DELEK