Secondary Education Examination

Model Questions

[redacted] A

Subject: **Science and Technology** F.M: 75

Time: 3 hours

Section-A

1. Encircle (0) the correct alternatives. (10 X 1=10)

a. Which of the following group of animals belong to Annelida?
   (a) Roundworm, hook worm, pin worm
   (b) Leech, *Nereis,* earthworm
   (c) Tapeworm, liver fluke, blood fluke
   (d) Earthworm, pinworm, liver fluke

b. Which of the following represents the systolic pressure while measuring blood pressure using a stethoscope?
   (a) The pressure during heartbeats or contractions
   (b) The pressure during relaxation of the heart
   (c) The average pressure over time
   (d) The pressure in the veins

c. What is the term for the substance produced by worker bees from nectar, stored in honeycombs, and used as a food source for the colony during periods of scarcity?
   (a) Pollen (b) Royaljelly (c) Honey (d) Propolis

d. When a cross is made between two heterozygous individuals for a single trait, say Axial (Aa x Aa), what is the expected phenotypic ratio in their offspring according to Mendelian genetics?
   (a) 1:1 (b) 1:2:1 (c) 3:1 (d) 9:3:3:1

e. Which artery is related with purification of blood?
   (a) Pulmonary artery (b) Coronary artery
   (c) Hepatic artery (d) Renal artery

f. In the chemical equation: $AgNO_3 + NaCl \text{ ----> } AgCl + NaNO_3$, what type of reaction is occurring?
   (a) Synthesis reaction (b) Single replacement reaction
   (c) Decomposition reaction (d) Double replacement reaction

g. Which of following formula can be used to find height from the earth surface at which acceleration due to gravity is 9.8 m/s^2?
   (a) $g = \frac{GMm}{-i;z}$ (b) $g = \frac{GMm}{7}$ (c) $g = \frac{GMm}{(R+h)_2}$ (d) $g = \frac{GM}{(R+h)_2}$

h. If a transformer has a turns ratio of 1:4 and the primary voltage is 20OV, what is the secondary voltage?
(a) 5OV (b) lOOV (c) 20OV (d) SOOY

1. A fact and two statements related with honey bees are given below:
Fact: Drones are genetically male bees.
Statements:
1. Drones survive for the longest period relative to other bees in the hive.
2. Drones have 16 chromosomes in their cells.
(a) Fact and statement 1 are true but statement 2 is false.
(b) Fact and statement 2 are true but statement 1 is false
(c) Fact and statement 2 are false but statement 1 is true
(d) Fact and statement 1 are false but statement 2 is false

J. Considering the structural components ofDNA, which of the following statements provides the most accurate insight into the functional significance of thymine as a pyrimidine base?
(a) Thymine contributes to the stability of the DNA double helix .
(b) Thymine forms double hydrogen bonds with adenine, important for genetic reliability .
(c) Thymine influences protein synthesis by participating in RNA synthesis.
(d) Thymine's presence in DNA has no specific functional impact.

Section-B

2. Answer the following questions in very short. (9 X 1=9)

a. Define ecosystem.
b. What is dispersion of light?
c. When does a WIFI be analog?
d. A crocodile animal has four chambered heart. In which class does it belong?
e. If a chamber of the heart is connected to the pulmonary veins, what type of blood does the chamber receive, and where is this blood coming from?
f. In a monohybrid cross between a heterozygous tall pea plant (Tt) and a dwarf homozygous recessive pea plant (tt), determine the genotype and phenotype of the Fl generation. Explain how the law of dominance is observed in this cross.
g. A student is investigating the relationship between the applied force and the mechanical advantage of a pulley system. The variables include the applied force, mechanical advantage, number of pulleys, and the load. Which variable(s) among applied force, mechanical advantage, number of pulleys, and load is/are the independent variable(s)?
h. How does the specialized role of a drone bee contribute to the overall function of the honey bee colony, and what physical characteristics distinguish a drone from other members of the hive?

i. In an accident a person having blood group B+ lost a large amount of blood from his body. If there are three blood groups AB+, B· and AB·, available in the blood bank, which blood group will be compatible to transfuse for the victim?

Section-C

Short answer type questions. **(14 X 2=28)**

3. Under what conditions does the value of gravitational force become equivalent to the gravitational constant (F = G)?

4. What is the term for a gas referred to as alkaline gas? Provide the chemicals utilized in the preparation of this gas in the laboratory

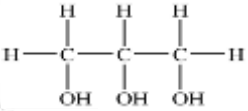
5. Currently, information can be transmitted rapidly through a fiber-optic internet. Specify the role of total internal reflection of light in the context of fiber-optic internet.

6. Why is iron preferred for manufacturing agricultural tools instead of aluminium? Give two reasons.

7. Study the given structural formula and answer the following questions.

(a) Name the given compound

(b) Write the name and structural formula of the compound which is formed by the replacement of three hydroxyl group by three hydrogen.



8. What is the basis for these sub divisions in the Kingdom Plantae?

(a) Gymnosperms (b) Angiosperms

9. Draw a diagram to show pulmonic blood circulation and systemic blood circulation .

10. Two foundations are shown in the diagram. If you are constructing a 6- story building and have to select one of the foundations shown, which one of them will you select? Explain with reason.

11. There are three persons having vision problems . Person A cannot distinguish blue light, person B has blurred vision for both near and far objects and person C cannot read letters on hoarding boards.

(a) Who of them needs surgery of eye lens?

(b) Who of them has problems in cone cells?

12. Urea is a chemical fertilizer manufactured using alkaline and acidic gases under certain conditions. Name these gases and provide the balanced equation for the chemical reaction involved in the formation of urea.

13. Compare and contrast fundamenta l and derived units.

14. Given the list of animals and plants provided, organize them into their appropriate categories within the designated boxes. Explain the process by which bacteria and fungi reintroduce nutrients lost from the soil back into the soil.

Small fish, heron, duck, snake, fungi, frog, mosquito-larvae , big fish, algae, bacteria, phytoplanktons, zooplanktons

producers	Primary consumers	Secondary consum ers	Tertiary consumers	Decomposers

15. Draw a ray diagram to illustrate the formation of an image by a convex lens when an object is positioned beyond the focal point. Mention the nature and size of an image of the object.

16. Why is respiration considered an exothermic reaction? Explain with chemical reaction.

Section-D

Long answer type questions. **(7 X 4=28)**

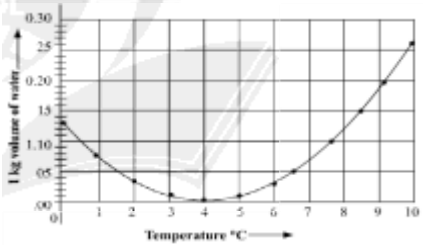
17. Investigate the corelation between the volume and temperature of water shown in the figure in the graph and answer to the following questions.

(a) What is the term for the distinctive property of water illustrated in the figure?

(b) State the change in volume of water observed when heating water from 0°c to 10°c.

(c) Elaborate any one significance of this property of water in everyday life.

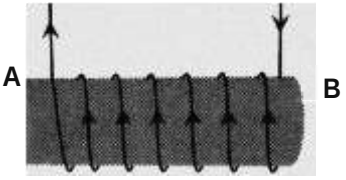
(d) Construct a graphical representation to study the relation between water density and tempe rature, using the provided graph as a reference for the relationship .



18. A solenoid is shown with its connection in a closed circuit as given in the diagram alongside.

(a) Identify the magnetic pole formed at point B in the solenoid.

(b) Describe two methods by which the polarity of a magnet can be reversed.



(c) Explain two practical applications of solenoids in daily life .

19. Excessive usage of chemical pesticides in the crop land in the village has led to complex health issues in people and environmental problems. Propose potential alternatives to address these challenges and provide recommendations. What are the contrasts between chemical and biological pesticides?

20. The given passage is a part of article written by Samiksha Shrestha, published in my Republica on 15th May 2023:

"Freelance work in IT allows for a flexible work schedule, which can be particularly beneficial for young professionals seeking a balance between work and personal life. One can work from home or anywhere with an internet connection and can work according to one's own schedule. It provides an opportunity to work with clients from around the world and exposes one to different cultures, working styles, and perspectives, helping you develop skills and broaden your horizons."

(a) What is the role of digital wellbeing in the technology mentioned in the article?

(b) In which system the signals are transmitted in the medium of this technology?

(c) Make a flow chart showing use of modulator, demodulator , encoder and decoder in the type of communication mentioned in the article .

21. Evaluate the significance of In Vitro Fertilization (IVF) as a beneficial technology for couples facing infertility. Provide a detailed justification for this statement, citing at least two reasons that highlight the positive impact of IVF on addressing fertility challenges. Also , briefly discuss any ethical considerations associated with the use ofI VF.

22. Calculate the weight of an object with a mass of 50 kg when located 8,848 meters above the Earth's surface. Given that the mass and radius of the Earth are 6 x I0 A24 kg and 6,400 km, respectively.

23. The position of three elements X, Y, Z and P in the modem periodic table is as follows:

(a) Write formula of compound formed between:

1. Y and X
ii. Y and Z

(b) Is any of the four elements a metal? Give reason to justify your answer.

(c) Write any two differences between P and X.

Group→ / Period ↓	1	2	13	14	15	16	17	18
1	Y							
2							X	
3	P					Z		

Secondary Education Examination

Model Questions

Set B

Subject: **Science and Technology** F.M: 75

Time: 3 hours

Section-A

1. Encircle (0) the correct alternatives. (lOx1=10)

a. Which of the following indicates the chromosomes of the cells in the male body?

(a) 44+XY (b) 44+ XX (c) 22+XY (d) 22+XX

b. Which is the necessary condition for the total internal reflection?

(a) Light passes from rarer to denser medium.
(b) Angle of incidence is greater than critical angle
(c) Angle of incidence is lesser than critical angle
(d) Angle of incidence is equal to angle ofreflection

c. WBCs are the soldier cells and acts as phagocytes responsible for defending the pathogenic microorganisms; however few of them are not involve in this process, if so pick up the **granulocyte involved tn phagocytosis of microorganisms** mainly the bacteria ?

(a) Monocytes (b) Neutrophils
(c) Lymphocyte (d) Basophils

d. Which medicinal plant can be used for the treatment of skin diseases?

(a) Cordyceps sinenses (b) *Azadirachta indica*
(c) *Tinospora cardifolia* (d) *Acorus calamus*

e. Which of the following has functional group?

(a) Ethyne (b) Ethene
(c) Hexene (d) Acetic acid

f. What will be changed in gravitational force, if both masses are doubled and distance between them is made halv ed?

(a) Gravitational force will be increased by 16 times
(b) Gravitational force will be decreased by I 6 times
(c) Gravitational force will remain same
(d) Gravitational force will be increased by 8 times

g. What is the major similarity in electric motor and transformer?

(a) Both need AC input in their coil

(b) Both need DC input in their coil
(c) Both have similar type of coils
(d) Both hav e magnet in them

h. Which one of the following is true about the anomalous expansion of water?
(a) It has maximum volume at 4°C
(b) It has minimum volume at 4°C
(c) It has maximum density at 0°C
(d) It has minimum density at 4°C

How many bits are there in a byte?
(a) 4 (b) 8 (c) 16 (d) 32

J. The dimension of water tank is (5 x 4 x 2) m respectively. If half of the tank is filled with water, then what is the pressure exerted by the water on the bottom of the tank?
(a) 9800 Pa (b) 19600 Pa
(c) 392000 Pa (d) 49000 Pa

Section-B

2. Write very short answer of following questions. (9xl=9)

a. Write the function of heparin.
b. Which negative catalyst is used while decomposing hydrogen peroxide into water and oxygen?
c. Why is carbon dioxide considered as acidic gas?
d. What is the purpose of changing digital signal into analogue signal ?
e. Write one difference between short period and long period in modem periodic table.
f. Write one chemical name of detergent.
g. What type of offspring will be formed in first filial generation when hybrid black (Bb) and white (bb) cat are crossed?
h. What is critical angle?
1. A lens can form virtual and erect image of an object kept in between F and O of it. In the remedy of which defect of the spectacles having such lenses can be used?

Section-C

Short answer questions. (14x2=28)

3. Which bee dies after mating and why?
4. Mention any two causes of climate change.
5. Digital transmission is more reliable than analog transmission, why?
6. Classify Pistia and Jellyfish.

7. What will happen if meiosis cell division doesn't occur in the reproductive cell of an organism? Explain.
8. The weight of an object in air is 20N. If it is immersed inside the water its weight becomes 15N then, find the mass of displaced water.
9. Clarify the interrelation between gravity and future of the universe?
10. "Use of insecticides is not a desired but compulsion ." Justify the statement in two points.
11. An organism 'A' is diploblastic and has hollow cavity where as an organism 'B' is segmented and triploblastic, if both of them are hermaphrodite. On the basis of given information identify their phylum and write their differences.
12. 10g of water at 30°C is mixed with 30g of water at 80°C. Find the resultant temperature. (Specific heat capacity of water is 4200J/kg^0 C)
13. Write the differences between calcination and roasting.
14. Which compound is formed by the removal of two hydrogen atoms from a saturated hydrocarbon having two carbon atoms? Also write its IUPAC name with two uses.
15. If you are provided 20g of solid zinc and same amount of zinc in powder form. If it is mixed with dilute sulphuric acid, which one of them produces large amount of hydrogen in short period of time? Explain.
16. How does vacuum package preserve the food? Explain.

Section-D

Long Answer questions. **(7X4=28)**

17. A gas 'P' is used to copy the map which is obtained from ammonium salt and base. Gas 'Q' is formed by strongly heating carbonate. A fertilizer company used both of them.
    (a) Identify the gas' Q'.
    (b) Identify the gas ' P'.
    (c) Write the action ofQ with phenolphthalein.
    (d) Write the reaction between two gases in fertilizer industry.
18. Differentiate between dependent variable and controlled variable. Identify the dependent and independent variables in following events:
    (a) In an experiment a researcher wants to study the interrelation between the rate of chemical reaction and amount of heat.
    (b) Use of fertilizer and growth of plant.
19. A burning candle is placed at 6 cm away from a convex lens having focal length 3 cm. Draw the ray diagram of image formed. Also find the magnification and power of lens.

20. Study the given table and answer the followin questions:

Name of blood group	Antigen in RBC	Antibody in plasma
p	B	A (Anti-A)
Q	A	B (Anti-B)
R	None	A and B (Anti- A and B)
S	AandB	None

(a) Find the blood group P, Q, Rand S

(b) Write the function of antigen and antibody.

(c) Which one of them is universal donor if all type of blood has negative Rh- factor?

21. In a transformer the number of primary turns is six times more than secondary turns. If the output voltage is 220V and input voltage isIO0V , then find the number of primary turns and number of secondary turns in a transformer. Also identify the types of transformer and write its one application.

22. The given passage was published on the home page of Vatsalya on 17 December 2023:

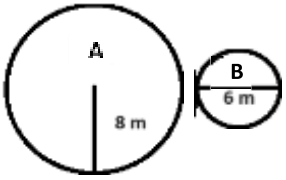
"Most of the people preferred going to neighbouring countries for such treatment usually due to social stigma. With the development of economy, literacy rate and exposure to outer world, people started seeking treatment for infertility issues. Many infertile couples were able to afford the treatment leading to an increase in the number of clinics providing fertility care in the capital Kathmandu and in regional areas. Now, about 30 clinics have gained registration from the Ministry of Health."

(a) What type of couples may be benefitted by the clinics mentioned in the article?

(b) Show the steps of the process related to the article in a flow chart in sequential order.

(c) Is the technology in the access of most of the Nepalese? Explain.

23. Mass of the objects A and B shown in the diagram are 500 kg and 200 kg respectively.



(a) If they are kept at a distance of 0.2 m between their surface, what will be the gravitational force between them?

(b) If acceleration due to gravity of a body B is 9.8 m/s^2 on the surface of the earth, at which height from the surface of the earth the body should be taken to be the acceleration due to gravity 6.5 m/s^2?