



UNICUS
OLYMPIADS

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Sample Paper



Class 11

Unicus Science Olympiad (USO)

Time: 60 minutes

Pattern and Marking Scheme			
Section	Total Questions	Marks per Question	Total Marks
Classic Section	40	1	40
Scholar Section	10	2	20
Grand Total	50		60

Classic Section (Each Question is 1 Mark)

1. Consider the following statements:

1. Cambium is responsible for secondary growth.
2. The cells of cork cambium undergo a series of mitotic divisions.
3. Cork provides protection for the plant from the invasion of the parasite.

Which of the statements(s) given above is/are correct?

- | | |
|-----------------|---------------|
| a. Only 1 | b. Only 2 |
| c. Only 1 and 2 | d. 1, 2 and 3 |
-

2. Which of the following are the functions of the ribosome?

1. It helps in the manufacture of protein molecules.
2. It helps in the manufacture of enzymes.
3. It helps in the manufacture of lipids.
4. It helps in the manufacture of starch molecules

- | | |
|------------|------------|
| a. 1 and 2 | b. 2 and 3 |
| c. 3 and 4 | d. 1 and 4 |
-

3. Which of the following are viral mosquito-borne diseases?

- | | |
|-------------------------------|----------------------------|
| a. Filariasis and Typhus | b. Polio and Diphtheria |
| c. Malaria and Chagas disease | d. Yellow fever and Dengue |
-

4. Fill in the blank:

Stainless steel is an alloy of chromium and nickel used in domestic utensils and in industry. It does not rust because _____.

- a. iron forms a hard chemical with chromium
 - b. chromium forms a coating of oxide that protects iron
 - c. nickel does not rust
 - d. the carbon of steel combines with chromium
-

5. The magnitude of e.m.f. produced in a coil, when a magnet is inserted into it, does not depend upon which of the following?

- | | |
|-------------------------------------|--------------------------------|
| a. The number of turns in the coil. | b. The resistance of the coil. |
| c. The shape of the magnet. | d. The speed of the magnet. |
-

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6. Choose the correct statement that describes veins:

- They have valves that ensure that the blood flows in only one direction. They collect the blood from different organs and bring it back to the heart.
 - They have thin walls with valves inside, blood flows under low pressure and carries blood away from the heart to various organs of the body.
 - They have thick elastic walls, blood flows under low pressure, carries blood from the heart to various organs of the body.
 - They have thick elastic walls without valves inside, blood flows under high pressure and carries blood away from the heart to different parts of the body.
-

7. Choose the correct option and complete the following sentence:

Offspring formed as a result of sexual reproduction exhibit more variations because

_____.

- sexual reproduction is a lengthy process
 - genetic material comes from two parents of the same species
 - genetic material comes from two parents of different species
 - genetic material comes from many parents
-

8. Acetic acid was added to a solid X kept in a test tube. A colourless and odourless gas was evolved. The gas was passed through lime water which turned milky. It was concluded that:

- solid X is sodium hydroxide and the gas evolved is O_2
 - solid X is sodium bicarbonate and the gas evolved is CO_2
 - solid X is sodium acetate and the gas evolved is CO
 - solid X is sodium chloride and the gas evolved is CO_2
-

9. Refer to the given passage and answer the following question:

When alcohols react with carboxylic acids in the presence of concentrated sulphuric acid, compounds with a fruity smell called esters are formed. Also, alcohols on oxidation in the presence of acidified $K_2Cr_2O_7$ form carboxylic acids.

C_2H_5OH on oxidation with acidified $K_2Cr_2O_7$ gives CH_3COOH .

Which of the following statements is/are correct regarding these two compounds?

- They both react with sodium metal to evolve a combustible gas.
- They both react with $NaHCO_3$ to evolve a gas which turns lime water milky.
- They both turn blue litmus red.

- | | |
|-----------------|---------------|
| a. 1 and 2 only | b. 2 only |
| c. 1 only | d. 1, 2 and 3 |
-

10. A mixture is formed by two kinds of matter, the molecules of which possess only vibratory motion. If the change in solubility of two substances in a given solvent differs widely with the change in temperature, how can these two solids be separated from the solvent?

- | | |
|----------------------------|-------------------------------|
| a. Fractional distillation | b. Fractional crystallisation |
| c. Sublimation | d. Sedimentation |
-

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11. In the given question, an assertion and a reason are given. Choose the correct option:

Assertion: Two balls of different masses are thrown vertically upward with the same speed. They will pass through their point of projection in the downward direction with the same speed. (Neglecting air resistance)

Reason: The maximum height and downward velocity attained at the point of projection are dependent on the mass of the ball.

- a. Both assertion and reason are correct and the reason is the correct explanation of the assertion.
 - b. Both assertion and reason are correct, but the reason is not the correct explanation of the assertion.
 - c. The assertion is correct, but the reason is incorrect.
 - d. The assertion is incorrect, but the reason is correct.
-

12. A simple pendulum has a time period T_1 when on the Earth's surface, and T_2 when taken to a height $2R$ above the Earth's surface, where 'R' is the radius of the Earth. The value of T_2/T_1 is:

- a. 1
 - b. $\sqrt{3}$
 - c. 1.5
 - d. 3
-

13. In the given question, an assertion and a reason are given. Choose the correct option:

Assertion: A balloon filled with hydrogen stops rising after it has attained a certain height in the sky.

Reason: As height increases, the density of air decreases resulting in an increase of buoyant force.

- a. Both assertion and reason are correct and the reason is the correct explanation of the assertion.
 - b. Both assertion and reason are correct, but the reason is not the correct explanation of the assertion.
 - c. The assertion is correct, but the reason is incorrect.
 - d. The assertion is incorrect, but the reason is correct.
-

14. Identify the characteristic features of yeast:

- 1. Possession of cell wall made up of chitin
- 2. Prokaryotic cell structure
- 3. Saprophytic mode of nutrition
- 4. Absence of mitochondria in cells

- a. 1, 3 and 4
 - b. 1 and 4
 - c. 1 and 3
 - d. 1, 2 and 3
-

15. In order to study the rates of diffusion of different liquids, Jack took two beakers having some water and added a drop of honey in one beaker and a drop of ink in another beaker by the sides of the walls.

Which of the following would he observe?

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- a. The rate of diffusion of honey is much faster than ink.
 - b. The rate of diffusion of ink is much faster than honey.
 - c. The rate of diffusion of both honey and ink are the same.
 - d. Ink diffuses but honey does not.
-

16. Arya's teacher told him that the following data was obtained when dinitrogen and dioxygen react together to form different compounds.

S.No.	Mass of dinitrogen	Mass of dioxygen
1.	14 g	16 g
2.	14 g	32 g
3.	28 g	32 g
4.	28 g	80 g

Which law of chemical combination is obeyed by the above experimental data?

- a. Law of multiple proportions
 - b. Law of conservation of mass
 - c. Law of definite proportions
 - d. All of the above
-

17. A car driver takes a total of 2 h to make a journey of 75 km. She has a coffee break of half an hour and spends a quarter of an hour stationary in a traffic jam. At what average speed must she travel during the rest of the time if she wants to complete the journey in the 2 h?

- a. 18.88 m/s
 - b. 50 m/s
 - c. 60 m/s
 - d. 16.66 m/s
-

18. The ratio of the number of neutrons present in the two elements X and Y is 5 : 7 and the ratio of mass numbers is 10 : 13. The element X attains a stable octet configuration by losing two electrons from the fourth shell. Calculate the number of protons and neutrons present in Y:

- a. 20, 28
 - b. 20, 20
 - c. 20, 24
 - d. 24, 28
-

19. An atom of an element has one electron in the valence shell and the two consecutive inner shells have 8 electrons each. Write the electronic configuration of preceding and succeeding elements:

- a. Preceding element - 2, 8, 8, Succeeding element - 2, 8, 8, 2
 - b. Preceding element - 2, 8, 6, Succeeding element - 2, 8, 8
 - c. Preceding element - 2, 8, 4, Succeeding element - 2, 8, 6
 - d. Preceding element - 2, 8, 8, 2, Succeeding element - 2, 8, 8, 2, 1
-

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20. Consider the following statements and choose the correct option:

Statement 1: When hydrogen gas is passed over heated metallic oxide it removes the oxygen from it.

Statement 2: Hydrogen is an oxidising agent.

- a. Statement 1 is correct but statement 2 is incorrect.
 - b. Statement 1 is incorrect but statement 2 is correct.
 - c. Both the statements are correct.
 - d. Both the statements are incorrect.
-

21. The pH value of a neutral solution is 8 under experimental conditions. Identify the true statements regarding the solution:

- i. Phenolphthalein indicator shows pink colour in a solution of pH value 7.
- ii. If the temperature is increased the pH value of the solution may be reduced to 7.
- iii. Methyl orange indicator shows an orange-red colour in a solution of pH value less than 7.

- a. Only (i)
 - b. (i) and (iii)
 - c. (ii) and (iii)
 - d. Only (ii)
-

22. Susan saw her mother was placing a piece of ginger in the soil after the use. Identify the reason behind this:

- a. Ginger has the capability of generating into a new plant.
 - b. Ginger increases the fertility of the soil.
 - c. Ginger increases the salt content of the soil.
 - d. None of the above
-

23. Rubidium, Tin and Xenon are elements in the period 5 of the periodic table. In which group of the periodic table can these elements be found?

- a. Group 1, Group 14, Group 18
 - b. Group 2, Group 16, Group 14
 - c. Group 1, Group 17, Group 19
 - d. Group 1, Group 16, Group 18
-

24. Blue eye colour in humans is recessive to brown eye colour. The expected children of a marriage between a blue-eyed woman and brown-eyed male who had a blue-eyed mother are likely to be in the ratio of:

- a. all blue-eyed
 - b. three blue-eyed and one brown-eyed
 - c. all brown-eyed
 - d. one blue-eyed and one brown-eyed
-

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25. In the given question, an assertion and a reason are given. Choose the correct option:

Assertion: The pyramids of number, biomass and energy are always upright.

Reason: It happens because the producers always outnumber and outweigh the herbivores which in turn always outnumber and outweigh the carnivores.

- a. Both assertion and reason are correct and the reason is the correct explanation of the assertion.
 - b. Both assertion and reason are correct, but the reason is not the correct explanation of the assertion.
 - c. The assertion is correct, but the reason is incorrect.
 - d. Both assertion and reason are incorrect.
-

26. A student sitting on the last bench can read the letters written on the blackboard but is not able to read the letters written in his text book. Which of the following statements is correct?

- a. The near point of his eyes has receded away.
 - b. The near point of his eyes has come closer to him.
 - c. The far point of his eyes has come closer to him.
 - d. The far point of his eyes has receded away.
-

27. A 60-W bulb is switched on in a room. A 240-W heater is also turned on in the same room. The voltage of the mains is 120 V and the resistance of the connecting leads is 6Ω . Calculate the amount of current that flowing from the mains when both heater and bulb are switched on:

- a. 1.22 A
 - b. 2.43 A
 - c. 2.22 A
 - d. 3.22 A
-

28. A straight conductor carries a current. Assume that all free electrons in the conductor move with the same drift velocity v . A and B are two observers on a straight line XY parallel to the conductor. A is stationary. B moves along XY with a velocity v in the direction of the free electrons.

Then which of the following statements is correct?

- a. A and B observe the same magnetic field
 - b. A and B do not observe any electric field
 - c. A and B observe magnetic fields of the same magnitude but opposite directions
 - d. Both a and b
-

29. When copper turnings are added to silver nitrate solution, a blue coloured solution is formed after some time. It is because, copper -

- a. displaces silver from the solution
 - b. forms a blue coloured complex with AgNO_3
 - c. is oxidised to Cu^{2+}
 - d. is reduced to Cu^{2+}
-

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30. The human eye has essentially a lens and a retina used as a screen. Which one of the following statements is true about this combination of lens and retina?

- a. It is a convex lens with variable focal length and at a fixed distance between the retina and the lens.
 - b. It is a convex lens with variable focal length and its distance from the retina.
 - c. It is a convex lens of constant focal length at a fixed distance from the retina.
 - d. It is a concave lens of adjustable focal length at a fixed distance from the retina.
-

31. While looking at an image formed by a convex lens (one-half of the lens is covered with a black paper), which one of the following will happen to the image?

- a. Half of the image will be visible
 - b. Intensity of the image will be diminished
 - c. Image will be inverted now
 - d. One can see an image of smaller size
-

32. A glass vessel is filled with water up to the brim and a lid is fixed to it tightly. Then it is kept inside a freezer for hours. What is expected to happen?

- a. The water freezes to ice and the level of ice come down.
 - b. The water in the glass vessel simply freezes to ice.
 - c. The glass vessel breaks due to expansion as water freezes to ice.
 - d. The water does not freeze at all.
-

33. Which one of the following statements is correct?

- a. All arteries carry oxygenated blood.
 - b. All veins carry oxygenated blood.
 - c. Except pulmonary artery, all arteries carry oxygenated blood.
 - d. Except pulmonary vein, all veins carry oxygenated blood.
-

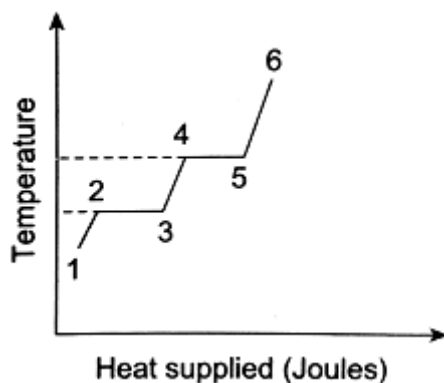
34. Match the following:

Column I	Column II
A. Yeast	i. Hydra
B. Amoeba	ii. Budding
C. Budding	iii. Starfish
D. Fragmentation	iv. Binary fission

- a. A-iv, B-ii, C-i, D-iii
 - b. A-ii, B-iv, C-iii, D-i
 - c. A-iv, B-ii, C-iii, D-i
 - d. A-ii, B-iv, C-i, D-iii
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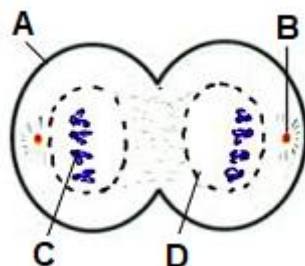
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35. Study the following graph and based on that answer the following question. The graph represents the various stages involved in step-wise change of ice to steam. Identify the stages associated with increase in kinetic energy:



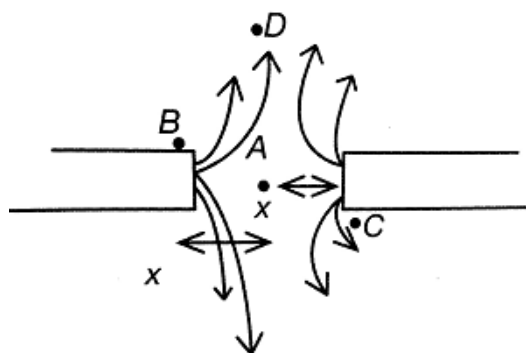
- a. 1 to 2 only
 b. 2 to 3 only
 c. 4 to 5 only
 d. 1 to 2, 3 to 4, 5 to 6

36. Consider the phase of mitosis that is shown in the figure below and label the parts A, B, C and D.



- a. A → Cell membrane, B → Centriole, C → Chromatids, D → Nuclear membrane
 b. A → Nuclear membrane, B → Centriole, C → Chromatids, D → Cell membrane
 c. A → Nuclear membrane, B → Chromosomes, C → Chromatids, D → Cell membrane
 d. A → Cell membrane, B → Chromatids, C → Chromosomes, D → Nuclear membrane

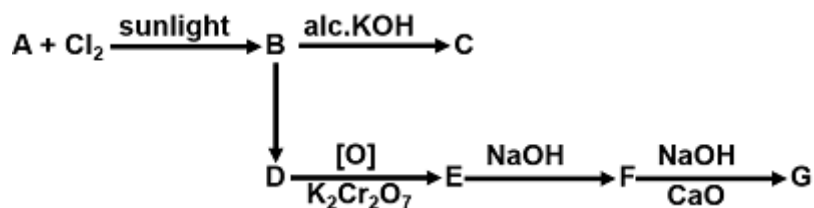
37. From the figure given below, choose the points where we will observe approximately similar magnetic field strength.



- a. A and D
 b. B and C
 c. C and D
 d. A and B

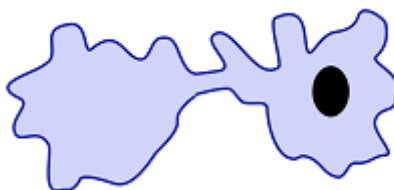
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38. 'A' is the second homologue of that series. Identify the compound 'G' in the reaction given below:



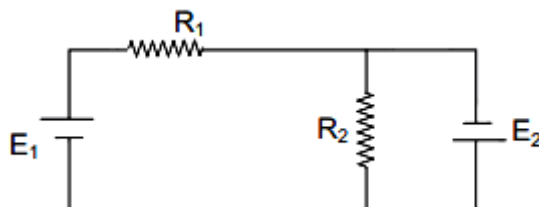
- a. Alkane
b. Alkene
c. Alkyne
d. Alkyl group

39. A student upon observing a permanent slide of binary fission in Amoeba drew the following diagram. Identify the fault in the diagram.



- a. Size of daughter cell to be formed is not appropriate.
b. Constriction has appeared before nuclear division.
c. Constriction is not equally deep on either side.
d. None of the above

40. Two resistances R_1 and R_2 are joined as shown in the figure, to two batteries of emf E_1 and E_2 . If E_2 is short-circuited, calculate the current through R_1 :



- a. E_1/R_1
b. E_2/R_1
c. E_2/R_2
d. $E_1/(R_1 + R_2)$

Scholar Section (Each Question is 2 Marks)

41. A student observed that the colour of pH paper changed to green when she dipped it in water. She added a few drops of concentrated hydrochloric acid to the water. The colour of the pH paper would turn to:

- a. light red
b. apple green
c. dark blue
d. lemon yellow

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42. Fill in the blank:

Bronze is often used to make statues and medals whereas brass is used in making utensils, scientific apparatus and cartridges. Both brass and bronze are copper containing alloys, yet they differ in their chemical composition for additionally containing _____.

- a. zinc in brass and tin in bronze
 - b. chromium in brass and nickel in bronze
 - c. nickel in brass and tin in bronze
 - d. iron in brass and nickel in bronze
-

43. If one puts one's ears to the steel rail, the sound of a coming train can be heard even when the train cannot be seen. One can conclude from this observation that:

1. Sound travels faster in steel than in air.
2. Amplitude of sound in the rail is much larger than in air.
3. Sound can travel larger distances in solids than in air.
4. Quality of sound in rail is better than in air.

Which of the above conclusion is/are correct?

- a. 1 and 3
 - b. 1 and 2
 - c. 2 and 3
 - d. 2 and 4
-

44. Read the following clues and identify the tissues:

1. Contains living cells having thin cell walls made up of cellulose.
2. Forms packing tissue in connecting different cells
3. Helps in the storage of starch and other organic substances, such as latex, resins, etc.
4. Helps in the sideways conduction of water.

- a. Sieve Tubes
 - b. Phloem Parenchyma
 - c. Phloem Fibres
 - d. Companion Cells
-

45. 'A' and 'B' are two oxides of carbon. 'A' is a poisonous gas and 'B' is a non-poisonous gas. On exposing to 'A', the victim should be given artificial respiration with carbogen which contains 'B' in small fraction. Identify A, B:

- a. A - O₂, B - CO₂
 - b. A - CO, B - CO₂
 - c. A - CO₂, B - CO₃
 - d. A - O₂, B - CO
-

46. A pungent smelling poisonous gas (A) is passed through a hot concentrated solution of potassium hydroxide (B). The solution is carefully evaporated to dryness under reduced pressure to give solid (C). Some of solid (C) is taken and mixed with black powder (D) and heated. A colourless, odourless, neutral gas (E) is evolved. Identify gas A:

- a. Hydrogen chloride
 - b. Ammonia
 - c. Chlorine
 - d. Nitrous oxide
-

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47. Two wires of the same material having lengths in the ratio of 1 : 2 and diameters in the ratio 2 : 1 are connected in series with a cell of 6 volt and internal resistance 1Ω . What is the ratio of the potential difference across the two wires?

- a. 1 : 2
b. 2 : 1
c. 1 : 8
d. 8 : 1

48. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as

- a. TTWW
b. TTww
c. TtWW
d. TtWw

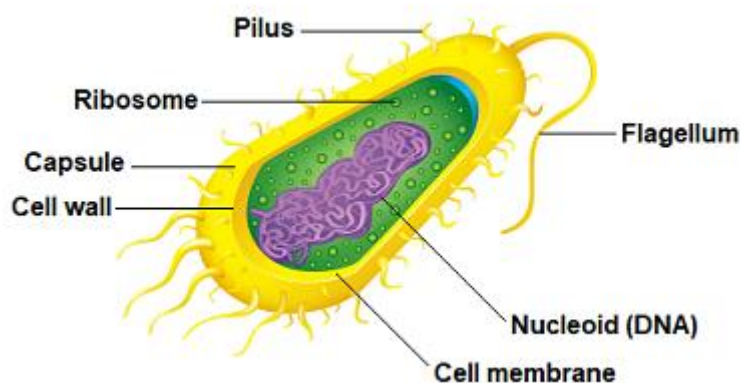
49. Complete the following table:

Enzymes	Functions
Erepsin	A
B	Maltose to glucose (simplest sugar)
Sucrase	C
D	Lactose to glucose and galactose
Lipase	E

- a. A-Peptides to amino acids, B-Maltase, C-Sucrose to glucose and fructose, D-Lactase, E-Fats to fatty acids and glycerols
b. A-Fats to amino acids, B-Maltase, C-Sucrose to maltose and fructose, D-Lactase, E-Peptides to fatty acids and glycerols
c. A-Peptides to amino acids, B-Lactase, C-Sucrose to glucose and fructose, D-Fructose, E-Fats to fatty acids and glycerols
d. A-Fats to glycerols, B-Maltase, C-Sucrose to glucose and fructose, D-Lactase, E-Peptides to amino acids

50. Following are the features of one of the five kingdom classification of organisms. Identify that kingdom:

1. Prokaryotic
2. Mostly unicellular
3. Cell wall present
4. Nuclear membrane absent
5. Mode of nutrition can be autotrophic or heterotrophic



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a. Protista
c. Fungi

b. Monera
d. Plantae

Answer Key

1.	d	2.	a	3.	d	4.	b	5.	c	6.	a	7.	b
8.	b	9.	c	10.	b	11.	c	12.	d	13.	c	14.	c
15.	b	16.	a	17.	d	18.	d	19.	a	20.	a	21.	c
22.	a	23.	a	24.	d	25.	d	26.	a	27.	c	28.	d
29.	c	30.	a	31.	b	32.	c	33.	c	34.	d	35.	d
36.	a	37.	b	38.	a	39.	b	40.	a	41.	a	42.	a
43.	a	44.	b	45.	b	46.	c	47.	c	48.	c	49.	a
50.	b												