Grade 10

CREST Science Olympiad (CSO)

Sample Paper

Pattern and Marking Scheme				
Grade	**Topic/Section**	**No. of Questions**	**Marks per Question**	**Total Marks**
Grade 10	Practical Science	40	1	40
	Achiever's Section	10	2	20
Grand Total		**50**		**60**

The total duration of the exam is 60 minutes.

Syllabus

Section 1: Chemical Reactions and Equations, Acids, Bases and Salts, Metals and Non-metals, Carbon and its Compounds, Periodic Classification of Elements, Life Processes, Reproduction in Organisms, Heredity and Evolution, Light-Reflection and Refraction, Human Eye and Colourful World, Electricity, Magnetic Effects of Electric Current, Sources of Energy, Our Environment and its Management.

Achievers Section: Higher Order Thinking Questions - Syllabus as per Section 1

For more details, visit https://www.crestolympiads.com/science-olympiad-cso

Practical Science (Each Question is 1 Mark)

1. When a person walking in bright sunlight enters a dark room, he is not able to see clearly for a little while.
Identify the correct reason for the above statement:

a. It is because the eye muscles cannot immediately adjust the focal length of the eye lens.
b. It is because the retina retains the bright image for some time and becomes momentarily insensitive.
c. It is because the iris is unable to contract the pupil immediately.
d. It is because the iris is unable to dilate the pupil immediately.

2. Which of the statements given below are correct?

I. Ohm's law is not applicable at very low and very high temperatures.
II. Ohm's law is applicable to the semiconductor.
III. Ohm's law is not applicable to electron tubes, discharge tubes and electrolytes.
IV. If a 24-volt battery is connected to a 6-ohm resistor, the current passing through the resistor is 4 A.

a. I, II and III
b. I, II and IV
c. I, III and IV
d. I, II, III and IV

3. Choose the correct option and complete the following sentence:
An electric motor consists of _____.

I. rectangular coil of insulated copper wire
II. two poles of a magnetic field
III. split rings
IV. conducting brushes

a. I and II
b. I, II and III
c. I, II, III and IV
d. None of these

4. Which of the following equations is not an example of displacement reaction?

a. $2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$
b. $Ca + Cl_2 \rightarrow CaCl_2$
c. $2KI + Cl_2 \rightarrow 2KCl + I_2$
d. $2Na + 2H_2O \rightarrow 2NaOH + H_2$

5. Fill in the blank:
Neutral water with pH of about 7 becomes slightly acidic when aerated. This is because _____.

a. oxygen from the air is dissolved in the water which makes the water acidic
b. dirt, which gets contaminated with the water during aeration makes the water acidic
c. ultraviolet radiation dissociates water molecules and makes water acidic
d. it absorbs carbon dioxide from air

6. Which one of the following elements is alloyed with iron to produce steel which can resist high temperatures and also have high hardness and abrasion resistance?

a. Aluminium
b. Chromium
c. Nickel
d. Tungsten

7. Which of the following equations is the summary of photosynthesis?

a. $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$
b. $6CO_2 + H_2O + \text{Sunlight} \rightarrow C_6H_{12}O_6 + O_2 + 6H_2O$
c. $6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$
d. $6CO_2 + 12H_2O + \text{Chlorophyll} \rightarrow C_6H_{12}O_6 + 6CO_2 + 6H_2O$

8. In the following question, an assertion and a reason are given. Choose the correct option:
Assertion (A): A person, who has suffered from smallpox can be recommended for providing nursing care to the victims of smallpox than the person who hadn't suffered from smallpox.
Reason (R): The immune system of the person who had suffered from smallpox remembers the microbes causing smallpox and responds vigorously on the next encounter.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true, but R is not the correct explanation of A
c. A is true, but R is false
d. Both A and R are false

9. The formation of the ozone hole in the Antarctic region has been a cause of concern. What could be the reason for the formation of this hole?

a. Presence of prominent tropospheric turbulence and inflow of chlorofluorocarbons.
b. Absence of polar front and stratospheric clouds and inflow of methane and chlorofluorocarbons.
c. Presence of prominent polar front and stratospheric clouds and inflow of chlorofluorocarbons.
d. The increased temperature at the polar region due to global warming.

10. Arrange the following in the increasing order of ease of oxidation:
(A) SO_4^{-2} (B) F^{-1} (C) Br^{-1} (D) OH^-

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

11. Identify the reaction which takes place at the anode when an aqueous solution of $CuSO_4$ is electrolysed using platinum as anode:

a. Hydroxyl ions get reduced to hydrogen.
b. Hydroxyl ions get oxidised to oxygen.
c. Copper metal gets oxidised.
d. Copper ions gets reduced.

12. Olivia measured the focal length of a convex lens by focusing a parallel beam of yellow, violet and green colours at the principal axis. If f_y, f_v and f_g are the respective focal lengths, then which among the following is the correct relation?

a. $f_v = f_y = f_g$
b. $f_v < f_g < f_y$
c. $f_v > f_y > f_g$
d. $f_v > f_g > f_y$

13. Which of the following statements is correct regarding the grafting process?

a. The rooted plant that is cut in a slanting manner is known as a scion.
b. The part of a stem that is cut in a slanting way is called stock.
c. This is a natural method of vegetative reproduction.
d. Grafting is practised for mango and citrus plants.

14. In the following question, an assertion and a reason are given. Choose the correct option:
Assertion (A): Children necessarily possess the same blood group as either of the parents.
Reason (R): The gene corresponding to the blood group has three alleles.

a. Both A and R are true and R is the correct explanation for A
b. Both A and R are true, but R is not the correct explanation for A
c. A is true and R is false
d. A is false and R is true

15. In the following question, an assertion and a reason are given. Choose the correct option:
Assertion (A): In any food chain, the number of organisms in any trophic level should always be less than that in its previous trophic level.
Reason (R): Only 10 percent of total energy present in a trophic level is transferred to the next trophic level in any food chain.

a. Both A and R are true and R is the correct explanation for A
b. Both A and R are true, but R is not the correct explanation for A
c. A is true and R is false
d. A is false and R is true

16. Which of the following metals cannot be refined by electrolytic refining?
i. Au
ii. Cu
iii. Na
iv. K

a. i and ii
b. i and iii
c. ii and iii
d. iii and iv

17. Identify the phenomenon by which a new set of the population is formed from the change in the frequency of some genes:

a. Genetic drift
b. Organic evolution
c. Variations
d. Speciation

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

Assertion: The magnetic field produced by a current-carrying solenoid is independent of its length and cross-section area.
Reason: The magnetic field inside the solenoid is uniform.

a. Both assertion and reason are true and reason is the correct explanation of assertion
b. Both assertion and reason are true, but reason is not the correct explanation of assertion
c. Assertion is true, but reason is false
d. Assertion is false, but reason is true

19. Which environmental hazard is not contributed by the combustion of fossil fuels?

a. Acid rain
b. Greenhouse effect
c. Destruction of wildlife habitat
d. Air pollution

20. Which of the following is obtained in its pure form by the reaction of sugar and sulphuric acid?

a. Water
b. Carbon
c. Oxygen
d. Hydrogen

21. Choose the correct option and complete the following sentence:
Sexual reproduction causes genetic variation because of _____.
1. blending of genes
2. chromosomal changes
3. shuffling of genes

a. Only 1
b. Only 2
c. Only 3
d. All of the above

22. Why shouldn't we light a candle in a closed room with people?

a. The CO_2 formed causes breathlessness.
b. Carbon particles are formed which are dangerous for the respiratory tract.
c. Methane gas, which is poisonous, is formed.
d. Carbon monoxide gas which reduces the ability of blood to carry oxygen is formed.

23. If I_1 is the first ionization potential, I_2 is the second ionization potential, I_3 is the third ionization potential and I_4 is the fourth ionization potential of an element, then which of the following has the least value?

a. I_1
b. I_2
c. I_3
d. I_4

24. Identify the correct sequence of fractions obtained when petroleum is subjected to fractional distillation:
1. Lubricating oil
2. Petrol
3. Petroleum ether
4. Diesel oil

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

25. What happens when 1 mole of ethyne undergoes complete combustion?

a. 2 moles of carbon monoxide and half-mole of water are formed
b. 4 mole of carbon dioxide and 1 mole of water are formed
c. 2 mole of carbon dioxide and 1 mole of water are formed
d. 2 moles of carbon dioxide and 2 moles of water are formed

26. When SO_2 is passed through a solution of $K_2Cr_2O_7$ turns green. Which of the following correctly shows the change in the oxidation state of chromium and sulphur?

a. +3 to +6 and +4 to +2 respectively
b. +6 to +3 and +4 to +6 respectively
c. +4 to +6 and +4 to -2 respectively
d. No change in 0 states

27. It is possible to measure the passage of 50 electrons per sec with a certain sensitive device. This corresponds to a current of:

a. 8×10^{-18} A
b. 1.6×10^{-20} A
c. 8×10^{-20} A
d. 1.6×10^{-19} A

28. Length and diameters of four wires of same material are given below. The resistance of which of the following wires will be minimum?

a. L and D
b. 2 L and D
c. (L/2) and 2D
d. 2 L and (D/2)

29. In the following question, an assertion and a reason are given. Choose the correct option:
Assertion: In a simple electric circuit, the positive terminal of the battery is a point of lowest potential.
Reason: The electronic current flow in a circuit is from a point of highest potential to a point of lowest potential.

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

30. Fill in the blank:
An electric current through a horizontal metal wire flows in East to West direction, the direction of the magnetic field at a point directly above it is from _____.

a. East to West
b. West to East
c. North to South
d. South to North

31. Which of the following statements about carbon is/are correct?
A. It has a small atomic size.
B. Its melting and boiling point is low as compared to other members of the group.
C. It shows the electropositive character.
D. It shows the maximum tendency of catenation.

a. A and B correct
b. B and D correct
c. A, C and D correct
d. A and D correct

32. Fill in the blank:
When a ray of light falls on a transparent glass plate, a part of it is reflected and a part is refracted. The reflected and refracted rays can be perpendicular to each other for _____.

a. angle of incidence equal to 90^o
b. angle of incidence equal to zero
c. only one angle of incidence
d. more than one angle of incidence

33. Match Column I (Vegetative propagation type) with Column II (Example):

Column I **(Vegetative propagation type)**		Column II **(Example)**	
1.	Tuber eye	a.	Garlic
2.	Bulb	b.	Rose
3.	Cutting	c.	Potato
4.	Plantlets at margins of leaves	d.	Bryophyllum

a. 1 – c, 2 – a, 3 – d, 4 – b
b. 1 – c, 2 – a, 3 – b, 4 – d
c. 1 – a, 2 – b, 3 – d, 4 – c
d. 1 – b, 2 – d, 3 – c, 4 – a

34. Match the entries of Column I with those of Column II:

	Column I		**Column II**
1.	Stomata	a.	Anaerobic respiration
2.	Mangrove trees	b.	Intake of CO_2
3.	Wood stem	c.	Pneumatophores
4.	Yeast	d.	Lenticels

a. 1 – b, 2 – c, 3 – d, 4 – a
b. 1 – b, 2 – a, 3 – d, 4 – c
c. 1 – d, 2 – a, 3 – c, 4 – b
d. 1 – a, 2 – b, 3 – c, 4 – d

35. Which of the following would stop evolution by natural selection from occurring?

a. If humans became extinct because of an epidemic disease.
b. If a thermonuclear war killed most living organisms and changed the environment drastically.
c. If ozone depletion led to increased ultraviolet radiation, which may cause many new mutations.
d. If all individuals in a population were genetically identical, and there was no genetic recombination, sexual reproduction, or mutation.

36. Which of the following statements correctly describes the concept of sustainable development?
i. Planned growth with minimum damage to the environment

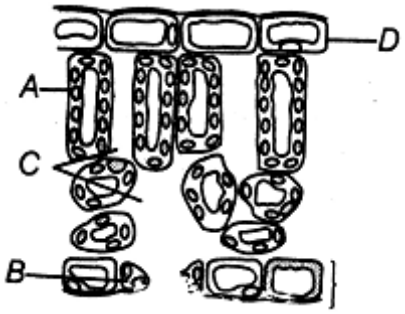
ii. Growth irrespective of the extent of damage caused to the environment
iii. Stopping all developmental work to conserve the environment
iv. Growth that is acceptable to all the stakeholders

a. i and iv
b. ii and iii
c. ii and iv
d. iii and iv

37. When current flows in a long straight solenoid, north and south poles are created at the two ends. Which of the following statements is/are correct?

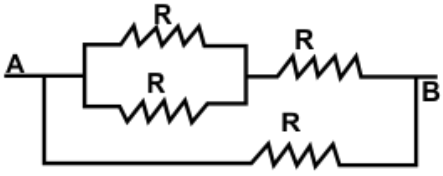
a. The field lines inside the solenoid are in the form of straight lines which indicate that the magnetic field is the same at all points inside the solenoid.
b. The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron when placed inside the coil.
c. The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.
d. Both a and b

38. Label A, B, C and D in the following diagram:



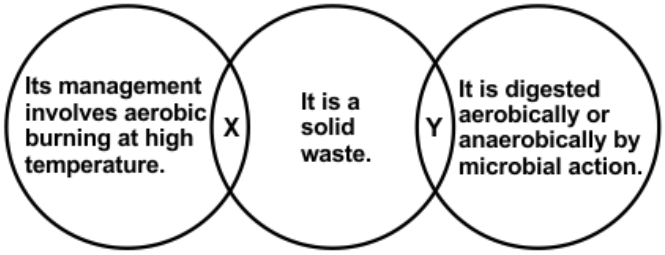
a. A-Chloroplast, B-Guard cell, C-Air spaces, D-Upper epidermis
b. A-Air spaces, B-Guard cell, C-Chloroplast, D-Epidermis
c. A-Guard cells, B-Air spaces, C-Chloroplast, D-Upper epidermis
d. A-Epidermis, B-Guard cells, C-Air spaces, D-Chloroplast

39. Study the circuit given below and determine the effective resistance (in Ω) between A and B:



a. 3R/5
b. 5R/3
c. 3R/7
d. 7R/3

40. Refer to the given diagram and select the incorrect option regarding X and Y:



a. X could be cow dung whereas Y could be chemicals from paint industries.
b. X could be used syringe whereas Y could be vegetable peels.
c. X is disposed off by the process called incineration whereas Y is disposed off by compositing.
d. X is converted into ashes and clinkers whereas Y is converted into humus.

Achiever's Section (Each Question is 2 Marks)

41. In the following question, an assertion and the reason are given. Choose the correct option:
Assertion (A): In the periodic table of chemical elements, electron affinity is always found to increase from top to bottom in a group.
Reason (R): In a group, the atomic radii generally increase from top to bottom.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true, but R is not the correct explanation of A
c. A is true, but R is false
d. A is false, but R is true

42. In the following question, an assertion and a reason are given. Choose the correct option:
Assertion (A): Generally, the colour of indicators changes in a particular pH range.
Reason (R): Indicators are weak acids or weak bases and exhibit different colours in molecular form and ionic form.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true, but R is not the correct explanation of A
c. A is true and R is false
d. A is false and R is true

43. An air bubble in a glass slab (μ = 3/2) is 6 cm deep when viewed from one face and 3 cm deep when viewed from the opposite face. Determine the thickness of the slab:

a. 9 cm
b. 13.5 cm
c. 15 cm
d. 18 cm

44. Fill in the blank:
When $Ca(NO_3)_2$ is heated, it gives CaO, $NO_2(g)$ and $O_2(g)$. The correct number of moles of $Ca(NO_3)_2$, CaO, $NO_2(g)$ and $O_2(g)$ are present in the reaction are respectively _____.

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

45. A convex mirror of focal length f produces an image $1/n^{th}$ of the size of the object. Calculate the distance of the object from the mirror:

a. $(n + 1)/n\ f$
b. $(n + 1)f$
c. $(n -1)f$
d. $(n -1/n)f$

46. Consider the following reaction:

$2CaO + C \rightarrow CaC_2 + 2CO$

$2CaC_2 + 2H_2O \rightarrow X + Y$

If X is involved in the neutralisation reaction with acid, then Y may be:

a. CH_4
b. C_2H_2
c. $Ca(OH)_2$
d. CaH_2

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

Assertion: According to Döbereiner's, a group of three similar elements arranged in their increasing atomic weights show that the atomic weight of middle is equal to the arithmetic mean of the other two elements.

Reason: Atomic weight is equal to one-twelfth of the mass of a carbon atom.

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

48. What volume of hydrogen gas at 273 K and 1 atm pressure will be consumed in obtaining 21.6 g of boron (Atomic mass: 10.8) from the reduction of BCl_3 by hydrogen?

a. 22.4 L
b. 44.8 L
c. 67.2 L
d. 89.6 L

49. 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. nickel in brass and tin in bronze
c. chromium in brass and nickel in bronze
d. iron in brass and nickel in bronze

50. Match column I with column II and select the correct answer using the codes given below:

	Column I		**Column II**
1.	Element with a smallest atomic radius	**a.**	Ca
2.	Element with the largest atomic radius	**b.**	F
3.	Element with the highest electron affinity	**c.**	Cl

a. 1 – c, 2 – b, 3 – a
b. 1 – b, 2 – a, 3 – c
c. 1 – a, 2 – b, 3 – c
d. 1 – a, 2 – c, 3 – b

Answer Key

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