01 **Answer Booklet**

Academic Year 2025/2026

Reading skills and knowledge acquired during studies

1. **C) The Renaissance saw major developments in science, art, and literature.**

   The passage highlights the advancements in art, literature, and science during the Renaissance.

2. **D) Marie Curie – The discovery of Oxygen**

   Oxygen was discovered by Joseph Priestley, not Marie Curie. Curie is known for her work on radioactivity and the discovery of polonium and radium.

3. **B) A dystopian novel about a totalitarian regime.**

   1984 by George Orwell depicts a dystopian society under a totalitarian regime.

4. **B) The UN's primary goal is to promote international peace and cooperation.**

   The United Nations was founded in 1945 with the primary aim of maintaining international peace and fostering cooperation among nations.

Logical reasoning and problem-solving

5. **E**

$$28 - 4 = 24$$

$$n = \frac{480}{24} = 20$$

6. **C**

   Let x be the wrong answers. Correct answers = 60 - x.

   Score equation: 3(60 - x) - x = 100.

   Solving gives x = 20 wrong answers.

7. **D**

   12 boxes (25 each) = 300 balloons for $24.

   10 single balloons (10 cents each) = $1.

   Total cost = $25.

8. B

Niko is the 8th oldest, meaning 7 are older.

He is the 12th youngest, meaning 11 are younger.

Total students = 7 + 1 + 11 = 19.

9. E

Let x be soda calories. Fries = x + 350.

Given: 2 fries + 3 sodas = 1500.

Solving 2(x + 350) + 3x = 1500, we get soda = 160.

Fries = 160 + 350 = 510.

Biology

10. C

A. The Golgi apparatus does not digest lipids.
B. Ribosome is an organelle which is not surrounded by membrane in any kind of cells.
C. The Cell wall is freely permeable, but cell surface membrane is semi-permeable.
D. Cell surface membrane of a plant cell determines which molecule to enter/exit the cell.
E. Centrioles are present in all eukaryotic cells except plants (complex plants).

11. B

A. Lipids are macromolecules and not polymers.
B. Carbohydrates are made of ~~**only**~~ carbon and hydrogen molecules and oxygen. (Hydrate means water which is H and O)
C. Multiple amino-acids joined together cannot be called “protein”, they are polypeptide.
D. Nucleic acids are polymer and also macromolecules.
E. Sucrose, maltose and lactose are examples of disaccharides.

12. E

1) Cholesterol has a hydrophobic and also a hydrophilic part. (correct)
2) Cholesterol is presented much in animal eukaryotic cells, and in lower scale in plant cells. (wrong)
3) Cholesterol is not presented in prokaryotic cells. (correct)
4) Cholesterol has an effect on both permeability of the membrane and making the membrane more resistant to both hot and cold temperature. (wrong)

13. D

Let’s sum all the atoms together. The result would be $3(C_8H_{16}O_2) + C_3H_8O_3$.
So, the result would be $C_{27}H_{56}O_9$. To produce this molecule **three water molecules should be resealed.** So, $3(H_2O)$ should be removed from the formula. Therefore, the final formula would be **$C_{27}H_{50}O_6$**.

14. E

1) P is the Golgi apparatus which processes protein molecules came from the RER.
2) S is the mitochondria which is responsible for cellular respiration.
3) Q is the centriole which is one of the characteristics that shows this cell does not belong to a complex plant. (animal and simple plants)
4) T is the nucleolus which is responsible for the production of Ribosomes (dot-shape structures on R which is RER.)

15. D

Enzymes are protein molecules which should be globular to have a function, and their structures are fragile in high temperature and low pH (not all of them, but most of them.)

16. A

A. It obeys the steepness of concentration gradient.
B. Polar molecules with small sizes should use this path. (Polarity and/or size)
C. Water uses this path also but can diffuse and pass the membrane without this path.
D. It does not need to consume any energy due to the fact in choice A.
E. The protein involved in this path is called the “carrier” and “channel”. Pumps are in active transport.

17. D

A Muscle cell should have more protein molecules (ribosome), Calcium ions (SER) and energy to consume (Mitochondria).

18. D

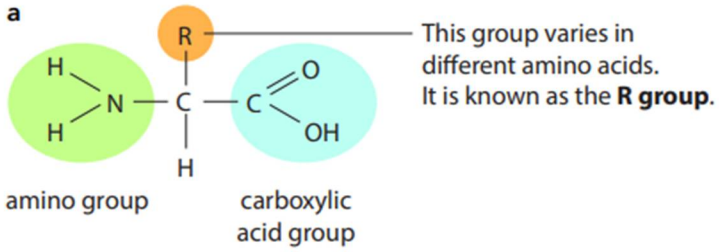
Golgi apparatus makes both glycolipids and glycoproteins. It is involved in production of Lysosome besides RER. Golgi apparatus releases mucin in organs which need to have a mucosal structure.
The novel cell wall is made by Golgi apparatus after cell division in plant cells.

19. A

A. Amylopectin is shorter than amylose molecules. Because it is full of branches.
B. A starch molecule contains both amylopectin and amylose at the same time.
C. Glycogen is a similar molecule to amylopectin, but it is presented in animal cells.
D. The link between glucose molecules in starch is both 1-6 and 1-4, and same in glycogen.
E. Cellulose molecules are the most abundant polysaccharides (and even organic molecules) in nature.

20. E

Look at the picture below. (Figure 2.16, Cambridge As & A level)



21. C

A. The primary structure is the same as the polypeptide chain.
B. The secondary structure is very weak and fragile.
C. The tertiary structure is the final structure in one polypeptide chains.
D. The quaternary structure is made by the same bonds in the tertiary structure.
E. Disulfide bond is not always presented and is just there when there is a sulfur atom (cysteine).

22. B

Eukaryotic ribosomes are divided into two groups: those inside the mitochondria or chloroplasts (70S), and those outside of them (80S).
All the other choices are ribosomal facts and correct!

23. D

Nucleolus is the largest organelle with an envelope. It contains most of the genetic material inside the cell. (there is some inside the mitochondria and chloroplast). Ribosomes are made inside the nucleolus so they can be seen inside this organelle. Nucleolus is large enough to be seen by the light microscope.

24. B

An organelle with a membrane called Tonoplast is the vacuole. Vacuole can be presented in some different kinds in cells. In plant cells, there is a central vacuole which is very large and constant. There would be some temporary vacuoles in animal cells that act differently from the central vacuole.
Tonoplast is a one-layer membrane, while envelopes are two-layer membranes.
Moreover, Lysosomes are presented in plant cells. This is despite the same act of vacuoles.

25. C

A. The observed size of the image divided by the actual size is called “magnification”.
B. Resolution and magnification are not the same
C. TEM gives us a better resolution than SEM. (one of SEMs disadvantages)
D. SEM is used to watch the surface (S in SEM means surface) part of a cell.
E. Resolution is the ability to distinguish between 2 separate points.

26. E

SER is used for both calcium reservation which is used in muscular cells for their contractions, and drug metabolism which happens more in liver cells.

27. D

1) A competitive inhibition is when a substance similar to the substrate gets inside the active site. (correct)
2) A non-competitive inhibition is not related to the active site. (wrong)
3) A non-competitive inhibition does not mean that there is no way back to the reaction, ever. There are reversible non-competitive inhibitions which means that there is a way back! (wrong)
4) An end-product inhibition (is a non-competitive inhibition method) example is not in fake-drinking-alcohol toxicity, because this toxicity treatment is performed based on the competition of ethanol and other alcohol.

28. B

A. pH and temperature have effects on their function.
B. Speed and affinity are not co-related.
C. Substrate concentration affects the initial rate of enzyme activity and makes it higher.
D. Some enzymes can work more properly in lower pH, e.g. those in the stomach of an animal.
E. Enzymes are biological catalysts.

29. D

If the image is assumed acting as a living organism membrane, no molecule will pass through the membrane except water. Water moves from the palce with low concentration to the place with more concentration.

30. A

A. Lysozyme is an enzyme used in immune actions.
B. Lysozyme acts against bacteria.
C. Lysosome is a digestive organelle.
D. Vacuole can act as Lysosome in plant cells.
E. Lysosome can be seen in plant cells.

31. C

A. Endocardial tissue (inside of the heart) does not contain cilia.
B. The rectal lumen does not contain cilia and is complex squamous tissue.
C. Oviduct has cilia.
D. Inside the vessel lumen is not any cilia.
E. Oral cavity (inside the mouth) does not contain cilia.

32. A

A. Liver is below the diaphragm.
B. Heart is superior to the diaphragm.
C. Esophagus (most parts) is superior to the diaphragm. (only little part is below it)
D. Lungs is superior to the diaphragm.
E. Ascending aorta is superior to the diaphragm. (some other parts of aorta are below the diaphragm.)

Chemistry

33. D

Using $\frac{P_1}{T_1}=\frac{P_2}{T_2}$:

Initial temperature, T1=27◦C=27+273=300K

$$\frac{p}{300}=\frac{2p}{T_2}$$

Solving: T2=600K

34. A

$$H_2+Cl_2\rightarrow 2HCl$$

Calculate Moles of Reactants

- **Hydrogen (H_2):** $\frac{8g}{2g/mol}=4$ moles
- **Chlorine (Cl_2):** $\frac{71g}{71g/mol}=1$ mole

Identify the Limiting Reagent:

- The balanced equation shows **1 mole of Cl_2 reacts with 1 mole of H_2**.
- Since we have **1 mole of Cl_2 but 4 moles of H_2**, **Cl_2 is the limiting reagent** (it runs out first).

- This means **only 1 mole of H_2 will react**, leaving **3 moles of H_2 unreacted**.

Calculate the Theoretical Yield of HCl:

From the balanced equation, **1 mole of Cl_2 produces 2 moles of HCl**.

Since we have **1 mole of Cl_2**, the reaction produces:

- 1×2=2 moles of HCl
- **Theoretical HCl yield**: 2×36.5=73g
- **Applying 80% yield**: 73g×0.8=58.

35. B

We are given:

- **Room temperature** = 25°C
- **Pressure** = 1 atm
- **Volume** = **1 cm^3 (**$1\times10^{-3}\,L$**)**
- **Molar volume at room conditions** = **24,000 cm^3 (or 24 L) per mole of gas**
- **Avogadro's number=** $6.022\times10^{23}\,\text{molecules / mol}$
- We need to find the **number of molecules** in **1 cm^3** of oxygen gas.

$$\frac{1\ \text{cm}^3}{24,000\ \text{cm}^3/\text{mol}}\times 6.02\times10^{23}\,\text{molecules / mol} = 2.5\times10^{19}\ \text{molecules}$$

Alternative Approach Using the Ideal Gas Law

You also checked using the **ideal gas equation**:

$$PV = nRT$$

Substituting:

- P = 1 atm
- $V=1\times10^{-3}\,L$
- R = 0.0821 L·atm/mol·K
- T = 298 K (since 25°C = 298K)

$$\text{molecule} = n\times N_A = \frac{PV}{RT} = \frac{(1)\times(1\times10^{-3})}{(0.0821)\times(298)}\times6.02\times10^{23} = 2.5\times10^{19}\ \text{molecules}$$

36. A

$$P_{N_2} = P_T \times X_{N_2}$$

$$X_{N_2} = \frac{\text{mol } N_2}{\text{mol total}}$$

$$P_{N_2} = 2.4 \times \frac{0.3}{1.2} P_{N_2} = 0.6 \text{ atm}$$

37. A

$$2.7g\ N_2O_5 \times \frac{1\ mol}{108g\ N_2O_5} \times \frac{2\ mol\ N}{1\ mol\ N_2O_5} \times \frac{N_A\ atoms}{1\ mol\ N} = 3.01 \times 10^{23}$$

38. A

$P_1 = 9$ atm, $T_1 = 270K$
$P_2 = ?$, $T_2 = 300K$

$$\frac{9}{270} = \frac{P_2}{300} \Rightarrow P_2 = 10 \text{ atm}$$

39. B

$$4KMnO_4 + aH_2SO_4 + 5C_2H_5OH \rightarrow 4MnSO_4 + bK_2SO_4 + 5CH_3CO_2H + cH_2O$$

Steps:

1. **Balance K, Mn, C:**
    - **b=2** (since 4 $KMnO_4$ gives 2 K_2SO_4).
    - **Carbon is already balanced (5 ethanol → 5 acetic acid).**
2. **Balance Oxygen:**
    - Oxygen equation: $4a - c = 13$
3. **Balance Hydrogen:**
    - Hydrogen equation: $a+5=c$
4. **Solve equations:**
    - From $a+5=c$, substitute in $4a - c = 13$
    - Solving gives **a = 6, c = 11**.

40. A

1 torr = 1 mmHg, 760 torr = 1 atm, 1 atm = 10510^5 Pa, 1 bar ≈ 1 atm.

41. A

$$Na_2CO_3 \times \frac{1 \text{ mol}}{106g\ Na_2CO_3} \times \frac{3 \text{ mol } O}{1 \text{ mol } Na_2CO_3} \times \frac{N_A \text{ atoms}}{1 \text{ mol } O} = 0.011N_A$$

42. A

$$\frac{P}{300} = \frac{P_2}{600} \Rightarrow P_2 = 2P$$

43. E

$$4C_3H_5N_3O_9 \rightarrow 6N_2 + O_2 + 12CO_2 + 10H_2O$$

$$227g\ C_3H_5N_3O_9 \times \frac{1\,mol}{227g} \times \frac{6\ mol\ N_2}{4\ mol} \times \frac{80}{100} = 1.2$$

44. A

$$3 \times 10^3 g\ C_2H_6 \times \frac{1\,mol}{30g} \times \frac{6\ mol\ H}{1\,mol\ C_2H_6} \times \frac{N_A}{1\,mol} = 3.6 \times 10^{26}$$

45. D

$A \rightarrow 1.5$ mol, $B \rightarrow 1.5$ mol

$C \rightarrow 1$ mol, $D \rightarrow 2.5$ mol, $E \rightarrow 2$ mol

46.E

$$C_2H_2 + \frac{5}{2}O_2 \rightarrow 2CO_2 + H_2O$$

$$40\,dm^3 \times \frac{5}{2} = 100$$

47. C

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

$$0.05g\ CaCO_3 \times \frac{1\,mol}{100g\ CaCO_3} \times \frac{1\,mol\ CO_2}{1\,mol\ CaCO_3} \times \frac{24\,dm^3}{1\,mol} = 0.012$$

$$\frac{0.012}{10} \times 100 = 0.12$$

Physics and Mathematics

48. E

Convert all values to **picometers (pm):**

- **1.5 nm = 1500 pm**
- **0.0036 μm = 3600 pm**
- **1650 pm (already in pm)**

Now, order them from smallest to largest:
1.5 nm (1500 pm) < 1650 pm < 0.0036 μm (3600 pm)

49. B

The displacement is given by the area under the velocity-time graph.

From 0 to 1s, the area is negative, meaning the object moves in the negative direction.

From 1s onward, the area becomes positive, meaning the object starts moving back.

At some time between 1s and 2s, the total area cancels out, bringing the object back to its initial position.

50. E

V_A relative to B=40 m/s+30 m/s=70 m/s

51. A

Car X traveled $v_0 \times 20$.

Car Y traveled $v_0 \times 10$.

Since Car Y has traveled less distance than Car X, Car Y is behind Car X at t = 20s.

52. C

Since acceleration is the rate of change of velocity, a constant slope in the velocity-time graph means that the acceleration is constant.

53. D

$$\text{Displacement} = \frac{V_i + V_f}{2} \times t = \frac{10+30}{2} \times 5 = 100 \text{ m}$$

54. A

Net displacement = 12 km (west)

Time = 40 min = $\frac{2}{3}$hr

Average velocity = $\frac{12}{\frac{2}{3}} = 18\text{km/h}$

55. C

$$\frac{1}{2} - 3a = \frac{1}{8} + 3b \Rightarrow \frac{1}{2} - \frac{1}{8} = 3a + 3b$$

$$\frac{\cancel{3}}{8} = \cancel{3}(a+b) \Rightarrow a+b = \frac{1}{8}$$

56. C

$$\frac{2x+1}{3}-\frac{x-5}{2}=4 \Rightarrow \frac{(4x+2)-(3x-15)}{6}=4$$

$$x+17=24 \Rightarrow x=7$$

57. E

$$a=4 \quad , \quad b=3$$

$$\Rightarrow x=\frac{4}{3} \ , \ y=2 \ , \ z=\frac{2}{3}$$

$$\Rightarrow y>x>z$$

58. B

A line parallel to the y-axis is vertical and has the equation x = constant. Since the given point is (-5, 8), the equation is x = -5.

59. B

(2,1) must satisfy both inequalities:

$1>m(2)+2 \Rightarrow m<-\frac{1}{2}$ **(I is true)**

$1<n(2)-3 \Rightarrow n>2$ **(II is true)**

m+n > 0 is **not necessarily true**

60. C

$y \geq 8x+500$ First inequality

$y \geq -4x+200$ Second inequality

Multiply each side of the second inequality by 2 and then add it to the first inequality.

$3y \geq 900$ Sum of two inequalities

$y \geq 300$ Simplify.