

## June 3rd Mock 2025 Answers

### 1. D) John Milton – Paradise Lost

Paradise Lost is an epic poem based on the Book of Genesis in the Old Testament. It depicts the fall of Satan and the expulsion of Adam and Eve from the Garden of Eden. A distinguishing feature of this work is that Satan is not portrayed merely as a symbol of evil, but as a proud and tragic character, giving the narrative a profound sense of dramatic complexity. In recent IMAT exams, questions connecting literary works and their authors—especially in English literature—have been increasingly common.

Why the other options are incorrect:

- A) In Dante's *The Divine Comedy*, Satan does appear, but the main theme of the work is the journey toward divine justice and salvation.
- B) Chaucer's *The Canterbury Tales* is a collection of satirical stories that reflect medieval English society, not a religious epic.
- C) Blake is a symbolic poet exploring morality and society but is not known for epics.
- E) Swift's *Gulliver's Travels* is a work of satirical fiction unrelated to religious epics.

### 2. C) Laws in the Middle Ages were always formally written.

Explanation:

- A) Can be inferred from the statement: "Law was heavily influenced by religious authority."
  - B) Inferred from: "Religious doctrine and moral teaching often took precedence over legal consistency."
  - C) This cannot be inferred and actually contradicts the passage: "Medieval law was not always written or systematically codified."
  - D) Inferred from: "Canon law, developed and administered by the Catholic Church..."
  - E) Supported by: "Papal decrees governed both public and private life."
- Therefore, C is the only statement that cannot be inferred.

### 3. D) Ireland

Ireland is a member of the European Union but not part of the Schengen Agreement. Instead, it maintains a separate travel arrangement known as the Common Travel Area with the United Kingdom. As a result, Ireland is excluded from the list of countries that allow passport-free travel under Schengen rules.

- A) Norway is not an EU member, but it is a Schengen member.
  - B) Switzerland is also outside the EU, but participates in Schengen.
  - C) Poland is a member of both the EU and Schengen.
  - E) Austria is a member of both the EU and Schengen.
- Thus, Ireland is the only one that is not part of Schengen.

### 4. B) He said that he would come to the meeting.

- A) why is a relative adverb modifying "the reason."
- B) that is not a relative pronoun; it is a subordinating conjunction introducing indirect speech ("He said that...").
- C) where is a relative adverb modifying "the hotel."
- D) who is a relative pronoun referring to "the girl."

E) which is a relative pronoun referring to "the car."

Thus, B is the only sentence in which the underlined word is not functioning as a relative.

5 - C is correct, since all applicants who are shortlisted for an interview have submitted a completed application form.

6 - Given that 25% of students take both subjects, only 20% must be taking only chemistry, and only 35% must be taking only biology. Which means 55% of students must be taking only one of the two subjects. 55% of 800 is 440.

7 - The amount of adult tickets and student tickets add up to 120. Let's call the amount of adult tickets sold "a", and student tickets sold "s".

$$a + s = 120$$

$$12a + 8s = 1200$$

Isolating the s in the first equation gives us  $s = 120 - a$

We can insert this in the second equation, and find that  $4a = 240$ , and therefore  $a = 60$ .

Therefore, s should also be 60.

8 - The passage argues against the common belief that "natural" means "healthy or safe." It uses examples like toxic natural substances (arsenic, cyanide) and beneficial artificial ones (medicines) to show that a product's natural origin doesn't determine its safety or effectiveness. Thus, the most supported conclusion is that the 'natural' label doesn't guarantee safety.

9 - The difference between consecutive terms increases by 2 each time.

10. C) *The cell membrane pulls away from the cell wall due to water loss.*

In a hypertonic solution, where the external environment has a higher solute concentration than the cytoplasm, water exits the plant cell via osmosis. The rigid plant cell wall prevents the entire cell from shrinking, but the plasma membrane detaches from the wall. This condition is known as *plasmolysis*.

11. A) *Each antibody binds specifically to one type of antigen.*

Antibodies are proteins produced by plasma cells (activated B cells). Each antibody has a unique variable region that binds specifically to a single antigen. This specificity enables the immune system to target and neutralize specific pathogens.

12. C) *To drive the synthesis of ATP via chemiosmosis.*

The electron transport chain pumps protons into the intermembrane space, generating a proton gradient. This electrochemical gradient powers ATP synthase to convert ADP into ATP through chemiosmosis.

13. A)  $4 \rightarrow 5 \rightarrow 1 \rightarrow 3 \rightarrow 2$

14. C) *Accumulation of toxins in organisms higher in the food chain.*

This phenomenon is called *biomagnification*. Toxins accumulate in increasing concentrations at higher trophic levels because predators consume many contaminated prey.

15. A) *1 and 2 only*

Higher temperatures speed up enzyme activity until a certain point, after which denaturation occurs due to loss of protein structure. Enzymes are not consumed in reactions.

16. D) *1, 2 and 3*

All listed processes — transcription, splicing, and modification (capping and tailing) — happen in the nucleus before mRNA exits to the cytoplasm.

17. B) *1, 2, and 4 only*

Cholesterol maintains membrane fluidity. Proteins move laterally unless anchored. Small nonpolar molecules diffuse freely. The membrane is not symmetric (making 3 false).

18. B) ① = *memory and learning*, ② = *sensory relay station (thalamus)*, ④ = *balance coordination*

These regions correspond to the hippocampus, thalamus, and cerebellum respectively.

19. D) *50%*

If the mother is a carrier (Aa) and the father is not a carrier (AA), each child has a 50% chance of inheriting the recessive allele and being a carrier (Aa).

20. B) *Nucleolus*

The nucleolus is not surrounded by a membrane. It is a region within the nucleus involved in rRNA synthesis and ribosome assembly.

21. C) *Mitochondrial ribosomes are more similar to bacterial ribosomes than to those in the eukaryotic cytoplasm*

This similarity supports the endosymbiotic theory — mitochondria originated from engulfed prokaryotes.

22. C) *Facilitated diffusion*

Glucose is transported down its concentration gradient via specific protein channels — a passive process called facilitated diffusion.

23. C) *Oxygen*

O<sub>2</sub> is small and nonpolar, allowing it to diffuse directly through the hydrophobic core of the lipid bilayer.

24. A) *NADP<sup>+</sup>*

In the light reactions of photosynthesis, NADP<sup>+</sup> accepts electrons at the end of the electron transport chain to form NADPH.

25. C) *Oxygen originates from water molecules split during light-dependent reactions*

Labeled oxygen in water (<sup>18</sup>O) was detected in released O<sub>2</sub>, showing it comes from H<sub>2</sub>O, not CO<sub>2</sub>.

26. A) *NAD<sup>+</sup> is regenerated by converting pyruvate into lactic acid*

In anaerobic conditions, pyruvate is reduced to lactate to regenerate NAD<sup>+</sup>, allowing glycolysis to continue producing ATP.

27. D) *It acts as the final electron acceptor*

Oxygen accepts electrons and protons at the end of the ETC, forming water — critical for the chain to keep running.

28. B) *From 3' to 5' and synthesizes RNA in the 5' to 3' direction*

RNA polymerase reads the DNA template strand in the 3' to 5' direction and builds a complementary RNA strand 5' to 3'.

29. D) *Pairing of homologous chromosomes*

Only meiosis involves pairing of homologous chromosomes during prophase I for genetic recombination.

30. D) *A truncated protein due to premature stop codon*

UAA is a stop codon. Substituting UAU (tyrosine) with UAA halts translation prematurely.

31. C) *Haploid with duplicated chromosomes*

After meiosis I, cells have half the chromosome number (haploid), but each chromosome still has two sister chromatids.

32. C) *Incomplete dominance*

Heterozygous offspring show a blend of traits (e.g., red + white = pink), which defines incomplete dominance.

33. C)  $\text{NH}_3$  (ammonia)

A molecule's boiling point depends on the strength of the intermolecular forces acting between its particles. The stronger the force, the more energy (the higher the temperature) is required to separate the molecules and vaporize the substance.

Hydrogen bonding – an especially strong intermolecular force arising when an H atom covalently bound to a highly electronegative atom (F, O, or N) interacts with an F, O, or N atom on a neighboring molecule.

Dipole–dipole attraction – electrostatic attraction between the  $\delta^+$  portion of a polar molecule and the  $\delta^-$  portion of another polar molecule.

van der Waals (London dispersion) forces – the weakest forces, present between all molecules; they grow stronger as molar mass increases.

Evaluation of each choice

C)  $\text{NH}_3$  contains N–H bonds and therefore forms intermolecular hydrogen bonds—very strong forces.

E) HCl is polar and experiences dipole–dipole attraction, but this is weaker than hydrogen bonding.

A)  $\text{CH}_4$ , B)  $\text{CO}_2$ , D)  $\text{O}_2$  are non-polar molecules (or effectively non-polar overall) and interact only via weak dispersion forces.

Hence ammonia, which can hydrogen-bond, has the highest boiling point among the list. (Reference boiling points:  $\text{NH}_3$   $-33^\circ\text{C}$ ;  $\text{HCl}$   $-85^\circ\text{C}$ ;  $\text{CO}_2$   $-78^\circ\text{C}$  (sublimes);  $\text{O}_2$   $-183^\circ\text{C}$ ;  $\text{CH}_4$   $-162^\circ\text{C}$ .)

34. C)  $\text{Al}_2\text{O}_3$

Oxides are classified as acidic, basic, or amphoteric according to their chemical behavior.

- Basic oxides – metal oxides that yield bases with water and salts with acids (e.g.,  $\text{Na}_2\text{O}$ ,  $\text{CaO}$ ,  $\text{MgO}$ ).
- Acidic oxides – non-metal oxides that yield acids with water and salts with bases (e.g.,  $\text{CO}_2$ ,  $\text{SO}_3$ ,  $\text{P}_4\text{O}_{10}$ ).
- Amphoteric oxides – oxides that react with both acids and strong bases; typical of elements near the metal–non-metal border of the periodic table ( $\text{Al}$ ,  $\text{Zn}$ ,  $\text{Sn}$ ,  $\text{Pb}$ , etc.).

Classification of the choices

- A and E ( $\text{Na}_2\text{O}$ ,  $\text{CaO}$ ) – basic metal oxides.
- B and D ( $\text{CO}_2$ ,  $\text{SO}_3$ ) – acidic non-metal oxides.
- C  $\text{Al}_2\text{O}_3$  – the archetypal amphoteric oxide; it reacts as follows:
  - With acid:  $\text{Al}_2\text{O}_3 + 6\text{H}^+ \rightarrow 2\text{Al}^{3+} + 3\text{H}_2\text{O}$
  - With strong base:  $\text{Al}_2\text{O}_3 + 2\text{OH}^- + 3\text{H}_2\text{O} \rightarrow 2[\text{Al}(\text{OH})_4]^-$

35. A)  $\text{Ag}^+ + 2\text{NH}_3 \rightarrow [\text{Ag}(\text{NH}_3)_2]^+$

- Brønsted–Lowry definition: an acid donates a proton ( $\text{H}^+$ ) and a base accepts a proton; the reaction necessarily involves proton transfer.
- Lewis definition: an acid accepts an electron pair and a base donates an electron pair; proton transfer is not required.

Assessment of choices

A)  $\text{Ag}^+$  accepts an electron pair from the N atoms of two  $\text{NH}_3$  molecules, forming the complex ion  $[\text{Ag}(\text{NH}_3)_2]^+$ .

Lewis base:  $\text{NH}_3$  (electron-pair donor)

Lewis acid:  $\text{Ag}^+$  (electron-pair acceptor)

No proton exchange occurs, so the reaction cannot be framed as Brønsted–Lowry.

B)  $\text{CH}_3\text{COOH}$  donates an  $\text{H}^+$  to  $\text{NH}_3 \rightarrow$  a Brønsted–Lowry process.

C) Combustion of methane is an oxidation-reduction, not an acid–base reaction.

D)  $\text{CO}_2$  reacts with  $\text{OH}^-$  (no proton transfer). This too is Lewis but **A is the clearer, classic example involving complex-ion formation.**

E)  $\text{HCl} + \text{NaOH}$  is ordinary Brønsted–Lowry neutralization.

36. C) 1, 2 and 4 only

1. True. Nuclear charge rises across a period; outer electrons are held more tightly.
2. True. As one descends a group, atomic radius expands and shielding increases, weakening nuclear attraction.
3. False. Noble-gas atoms have exceptionally high ionization energies because of their stable closed shells.
4. True. Removing an electron from a positively charged ion always requires more energy than from the neutral atom.

Therefore, the correct set is 1, 2 and 4.

37. B) 0.20 M

The number of moles of solute remains constant during dilution.

$$C_1V_1 = C_2V_2 \rightarrow (1.0\text{ M})(100.0\text{ mL}) = C_2(500.0\text{ mL})$$

$$C_2 = 100/500 = 0.20\text{ M}.$$

38. C) a and e

First, identify the elements indicated in the diagram:

a: Period 4, Group 2  $\rightarrow$  Ca (Calcium)

b: Period 2, Group 2  $\rightarrow$  Be (Beryllium)

c: Period 2, Group 17  $\rightarrow$  F (Fluorine)

e: Period 5, Group 1  $\rightarrow$  Rb (Rubidium)

Next, determine which elements form strong bases.

Strong bases typically refer to the hydroxides of alkali metals (Group 1) and alkaline earth metals (Group 2) from calcium (Ca) downward.

a (Ca) is an alkaline earth metal. Its hydroxide,  $\text{Ca}(\text{OH})_2$ , is a representative strong base.

b (Be) is also an alkaline earth metal, but  $\text{Be}(\text{OH})_2$  is not a strong base; it is an amphoteric hydroxide.

c (F) is a non-metal element and

does not form a base.

e (Rb) is an alkali metal. Its hydroxide,  $\text{RbOH}$ , is also a representative strong base.

39. D) The overall enthalpy change equals the sum of bond energies of bonds broken minus those of bonds formed.

Explanation of each option

A) Endothermic reactions absorb heat from surroundings (they do not release it).

B) Exothermic reactions have negative  $\Delta H$ , not positive.

C) Breaking bonds requires energy (endothermic), not releases it.

D) Correct.  $\Delta H = \Sigma E(\text{bonds broken}) - \Sigma E(\text{bonds formed})$ .

E) Forming bonds releases energy, lowering  $\Delta H$ ; it does not require energy input.

40. E) 1, 3 and 4

Reaction characteristics – the forward reaction is endothermic and produces more gas molecules ( $1 \rightarrow 2$ ).

1. Increase T: an endothermic reaction is favoured (shift right).

2. Increase P: the equilibrium shifts toward the side with fewer moles of gas (left) – reduces  $\text{NO}_2$ .
3. Remove  $\text{NO}_2$ : lowers product concentration; system shifts right to replace it.
4. Add inert gas at constant pressure: the vessel volume must expand to keep pressure constant; partial pressures fall, effectively lowering total pressure, so the system shifts toward the side with more moles of gas (right).

Thus 1, 3, 4 enhance  $\text{NO}_2$  yield.

41. A) Trigonal pyramidal, tetrahedral, bent

(Values in the table:  $\text{NH}_3$  – 4 electron pairs/3 bonding;  $\text{CH}_4$  – 4/4;  $\text{H}_2\text{O}$  – 4/2.)

Explanation

- $\text{NH}_3$ : four electron domains (one lone pair) → trigonal pyramidal.
- $\text{CH}_4$ : four bonding pairs, no lone pairs → tetrahedral.
- $\text{H}_2\text{O}$ : two bonding pairs plus two lone pairs → bent (V-shaped).

42. A) 139.5 mg

Calculation

$$n(\text{MnO}_4^-) = 0.0200 \text{ mol L}^{-1} \times 25.0 \text{ mL} = 0.000500 \text{ mol}$$

$$\text{Stoichiometry } \text{MnO}_4^- : \text{Fe}^{2+} = 1 : 5 \rightarrow n(\text{Fe}^{2+}) = 0.00250 \text{ mol}$$

$$\text{Mass } \text{Fe}^{2+} = 0.00250 \text{ mol} \times 55.8 \text{ g mol}^{-1} = 0.1395 \text{ g} = 139.5 \text{ mg.}$$

43.A) 1 and 2 only (alkene and alcohol)

Structure:  $\text{CH}_3\text{--CH(OH)--CH=CH}_2$

- $\text{C=C}$  double bond → alkene.
- $\text{--OH}$  attached to  $\text{sp}^3 \text{ C}$  → alcohol.  
No  $\text{--CHO}$  (aldehyde) or  $\text{C=O}$  flanked by carbons (ketone).

44.D)  $\text{H}_2\text{SO}_4$

Electron totals (atomic numbers):

$$\text{A) } \text{C}_2\text{H}_5\text{NO}_2 = 2 \times 6 + 5 \times 1 + 7 + 2 \times 8 = 40$$

$$\text{B) } \text{CH}_3\text{COOH} = 2 \times 6 + 4 \times 1 + 2 \times 8 = 32$$

$$\text{C) } \text{C}_2\text{H}_6\text{O} = 2 \times 6 + 6 \times 1 + 8 = 26$$

$$\text{D) } \text{H}_2\text{SO}_4 = 2 \times 1 + 16 + 4 \times 8 = 50$$

$$\text{E) } \text{C}_6\text{H}_6 = 6 \times 6 + 6 \times 1 = 42$$

45.D) 13

Moles before reaction:

$$n(\text{H}^+) = 0.10 \text{ M} \times 0.010 \text{ L} = 0.0010 \text{ mol}$$

$$n(\text{OH}^-) = 0.30 \text{ M} \times 0.010 \text{ L} = 0.0030 \text{ mol}$$



Excess  $\text{OH}^-$  after neutralization:  $0.0030 - 0.0010 = 0.0020 \text{ mol}$   
 Total volume =  $20.0 \text{ mL} = 0.020 \text{ L}$   
 $[\text{OH}^-] = 0.0020 \text{ mol} / 0.020 \text{ L} = 0.10 \text{ M}$   
 $\text{pOH} = -\log 0.10 = 1 \rightarrow \text{pH} = 14 - 1 = 13.$

46.B)  $\text{HClO}_4$

Oxidation numbers

A)  $\text{HCl} - \text{Cl} = -1$

B)  $\text{HClO}_4 - \text{Cl} = +7$

C)  $\text{K}_2\text{Cr}_2\text{O}_7 - \text{Cr} = +6$

D)  $\text{NH}_4^+ - \text{N} = -3$  (H atoms are +1 each)

E)  $\text{CaSO}_4 - \text{S} = +6$

The maximum is +7 in perchloric acid.

47. C)  $-0.74^\circ\text{C}$

Calculations

$n(\text{urea}) = 2.4 \text{ g} / 60 \text{ g mol}^{-1} = 0.04 \text{ mol}$

$m = 0.04 \text{ mol} / 0.10 \text{ kg} = 0.40 \text{ mol kg}^{-1}$

$\Delta T_f = K_f \cdot m = 1.85 \times 0.40 = 0.74 \text{ K}$

Freezing point =  $0.00^\circ\text{C} - 0.74^\circ\text{C} = -0.74^\circ\text{C}.$

48 - Let's analyze the ellipse by converting its equation to its standard form.

$$x^2 - 6x + 4y^2 + 8y + 9 = 0$$

We can convert it to its standard form  $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

$$\frac{(x-3)^2}{2^2} + \frac{(y+1)^2}{1^2} = 1$$

In the standard form of an ellipse, the center of the ellipse is found in (h,k), and a and b are its semi-major and semi-minor axes meaning the ellipse stretches from the center by a and b along their respective axes. Given that  $h = 3$  and  $k = -1$ , the center of this ellipse can be found in (3, -1). And therefore we can know that, since a is 2, along the x axis, the ellipse spans from  $x = 5$  to  $x = 1$ . Along the y axis, it spans from  $y = 0$  to  $y = -2$ , touching the x axis.

49 - In order to find the probability that the committee has at least one woman, we can find the probability that it has no women, and subtract it from 1. Doing the calculations,  $5/9 \cdot 4/8 \cdot 3/7$  gives us  $5/42$ , and subtracting that from 1 gives us  $37/42$ .

$$50 - \left( \frac{2x^3}{y^2} \right)^2 = \left( \frac{4x^6}{y^4} \right)$$

$$\frac{4x^6}{y^4} \times \frac{y^4}{4x^2} = \frac{4x^6}{4x^2} \times \frac{y^4}{y^4} = x^4 \times 1$$

51 - First we get rid of the absolute value,

$$-3 < 1.5n - 4 < 3$$

Then we try to isolate n, the steps are as follows

$$1 < 1.5n < 7$$

$$1 < \frac{3}{2}n < 7$$

$$1 \times \frac{2}{3} < n < 7 \times \frac{2}{3}$$

$$\frac{2}{3} < n < \frac{14}{3}$$

Which gives n the possible values of 1, 2, 3, and 4.

$$52 - \frac{\tan x + \frac{\cos x}{\sin x}}{\frac{1}{\cos x} + \frac{1}{\sin x}}$$

Let's simplify the numerator first,

$$\text{As } \tan x = \frac{\sin x}{\cos x},$$

$$\tan x + \frac{\cos x}{\sin x} = \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} = \frac{\sin^2 x}{\cos x \times \sin x} + \frac{\cos^2 x}{\cos x \times \sin x}$$

$$\text{Since } \sin^2 x + \cos^2 x = 1,$$

$$\frac{\sin^2 x}{\cos x \times \sin x} + \frac{\cos^2 x}{\cos x \times \sin x} = \frac{1}{\cos x \times \sin x}$$

Looking at the denominator,

$$\frac{1}{\cos x} + \frac{1}{\sin x} = \frac{\sin x}{\cos x \times \sin x} + \frac{\cos x}{\cos x \times \sin x} = \frac{\sin x + \cos x}{\cos x \times \sin x}$$

So,

$$\frac{\frac{1}{\cos x \times \sin x}}{\frac{\sin x + \cos x}{\cos x \times \sin x}} = \frac{1}{\cos x \times \sin x} \times \frac{\cos x \times \sin x}{\sin x + \cos x} = \frac{1}{\sin x + \cos x}$$

53 - We will utilize the following properties of logarithms:

The product rule:  $\log(A) + \log(B) = \log(AB)$ ,

The quotient rule:  $\log(A) - \log(B) = \log(A/B)$ ,

The power rule:  $\log(A^B) = B \times \log(A)$

Combining all the logarithms into one,

$$\ln(x^2/4y) + \ln(xy) + \ln 8 = \ln\left(\frac{8x^3y}{4y}\right) = \ln(2x^3)$$

And

$$\ln(2x^3) = \ln(2) + \ln(x^3) = \ln(2) + 3\ln(x)$$

Therefore, our answer is D

54 - The expression  $x^3 + 6x^2 + 12x + 8$  is the cubic expansion of the binomial  $x + 2$ .

Therefore our expression is equal to

$$\sqrt[3]{\frac{(x+2)^3}{x^3}} \text{ which is equal to } \sqrt[3]{\left(\frac{x+2}{x}\right)^3} = \frac{x+2}{x}$$

55 - A and B are false because the net force in uniform circular motion is centripetal, or towards the center. In uniform circular motion, the angular velocity is constant, so C is incorrect.

*D is true, as the velocity changes not in magnitude but in direction. E is false, as since there is change in velocity, there must be acceleration.*

56 -

*A - is correct, as Newton's law of universal gravitation tells us that the gravitational force*

$$F = G \frac{m_1 m_2}{r^2}, \text{ which is proportional to } \frac{1}{r^2}.$$

*B is correct, as replacing  $m_1$  with  $2m_1$  and replacing  $m_2$  with  $2m_2$  would result in  $4G \frac{m_1 m_2}{r^2}$ , 4 times of the initial force.*

*C is correct, as replacing  $r$  with  $\frac{1}{2}r$  gives us  $G \frac{m_1 m_2}{4r^2}$ ,  $\frac{1}{4}$  of the initial force*

*D is correct, as the force is the same for both objects, and they're pulled towards each other.*

*E is incorrect, according to Newton's law of universal gravitation, the gravitational force does not depend on velocity.*

57 - We can use Ohm's law,  $v = i \times R$ .  $12V = 2A \times R$ , gives us  $R = 6\Omega$ .

58 - The ball, released quietly, maintains the airship's horizontal velocity of 20 m/s. Since this horizontal velocity is constant and the ball travels for 5 seconds, the horizontal distance covered is  $20 \text{ m/s} \times 5 \text{ s} = 100 \text{ meters}$ .

59 - Thermal efficiency is calculated by the work done by the system divided by the heat entering the system. The heat entering the system is  $20 \times 4.2 \times 10^7$  or  $8.4 \times 10^8$ .

$40/100 = W/(8.4 \times 10^8)$ , multiplying both sides by  $8.4 \times 10^8$  gives us  $3.36 \times 10^8 = W$ .

60 - For the net magnetic field at the center of the circular coil to be zero, the two magnetic fields need to cancel out. The magnetic field strength of a straight wire is given by  $B = \frac{\mu_0 I}{2\pi r}$ , where  $i$  is the current, and  $r$  is the distance from the wire in meters. The magnetic field at the center of a coil is given by  $B = \frac{\mu_0 NI}{2R}$ , where  $N$  is the amount of loops.

Since they cancel out, they must have the same magnitude.  $\frac{\mu_0 I}{2\pi r} = \frac{\mu_0 NI}{2R}$

Multiplying both sides by  $\frac{2}{\mu_0}$  gives us  $\frac{i}{\pi r} = \frac{NI}{R}$  where  $i = 15.7A$ ,  $N = 5$ ,  $r = 0.2 \text{ m}$ ,  $R = 0.1 \text{ m}$ .

Solving for  $I$  gives us  $I = \frac{1.57}{\pi}$ , which is roughly 0.5 A.