

## PMT Mock Paper Set A

### Answer Key - Section 2

- 1 E
- 2 A
- 3 B
- 4 C
- 5 D
- 6 B
- 7 C
- 8 A
- 9 D
- 10 B
- 11 D
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- 13 E
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- 18 A
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## Explained Answers - Section 2

1 E

Firstly, you need to remember that XY= male and XX= female.

Before we can draw a monohybrid cross, we need to assign letters to the recessive (disease-causing) and dominant alleles. It is common practice to use a capital letter for a dominant allele and lower-case for a recessive allele, but this is not essential.

For example,  $X^H$  for the dominant allele and  $x^h$  for the recessive allele.

We also need to work out the phenotype (genetic make-up) of Luca and Iva using the information in the question. We know Iva is not a carrier, meaning that she must have two dominant alleles. We also know that the male has the disease. As the name suggests, X-linked recessive diseases are caused by a recessive allele on the X chromosome. This means a male who inherits an X-linked recessive allele will immediately inherit the disease because there is no 'healthy' allele to 'counteract' the disease allele. This is why X-linked recessive diseases are more commonly seen in males, because males only have one X chromosome and therefore only need one allele to get the disease.

Knowing this information, you can draw a monohybrid such as the one below.

Looking at the monohybrid, you can see that since the father only has 1 X chromosome, both daughters must inherit a sex-linked recessive alleles (h). Since the mother is unaffected and not a carrier, the other allele they inherit must be dominant (H), meaning **the daughters can only be heterozygous for haemophilia**. Daughters will always therefore be carriers.

**Sons**, on the other hand, **only inherit one X allele from the mother**, and this will always be dominant (H), meaning that **sons will always be unaffected**.

Thus, the correct answer must be E. Luca and Iva's baby will be unaffected if it is a boy, and a carrier if it is a girl.

	$X^H$	$X^H$
$x^h$	$X^Hx^h$	$X^Hx^h$
Y	$X^HY$	$X^HY$



2 A

This question does not require you to know the elements of the periodic table by heart.

Using the information given in the question about the mass and atomic number of the element, you can determine the position of the element in the periodic table. This in turn will help you determine the properties of the element.

After reading the statements, you may notice that statements 2 and 4 conflict each other; **an element cannot be a noble gas and be in group 17 because it is group 18 elements that are referred to as noble gases**. If you notice this, option E can quickly be eliminated.

A good method for this question is to read each statement individually and determine whether it is correct or incorrect.

**Statement 1 is incorrect** because the mass number of this element is 35.

Relative mass is the mass of an atom relative to the mass of an atom of carbon-12. It is the same as the mass number of the atom.

*Relative atomic mass = No. of protons + no. of neutrons .*

**Statement 2 is incorrect** because this element is not a noble gas.

Noble gases are found in **group 18** of the periodic table and have a **full outer shell of electrons**, i.e. 8 electrons in their outer shell.

You are told element **X** has an atomic number of 17. This means it has 17 electrons. Its electronic configuration is therefore 2,8,7. Since element **X** has 7 electrons in its outer shell, it is in group 17 of the periodic table.

**Statement 3 is incorrect** because, knowing the element is in group 17, we know that it would gain only **1** electron to complete its outer shell. Therefore, it forms an ion with a **-1 charge**, rather than a -2 charge as said in the statement.

**Statement 4 is correct**- as explained above, the electronic configuration of this element is 2,8,7. With 7 electrons in its outer shell, it is **in group 17** of the periodic table.

**Statement 5 is incorrect** - we know element **X** is a halogen and it is true halogens react with metals to form salts. However, you must be aware of the specific details here.

Halogens react with **alkali metals** (**group 1** metals) to form salts. Calcium is a group 2 metal and so this statement is incorrect.

You could also determine this statement is incorrect by looking at the formula provided. Ca is in group 2, meaning it would form a 2+ ion. Since **X** is a halogen in group 17, it would form a 1- ion. Therefore, even if element **X** reacts with calcium to form a salt, the formula of the salt would be  $\text{CaX}_2$



3     **B**

**Statement 1** is correct because when insulators are rubbed together electrons move from one insulator to another. The insulator that loses electrons is positively charged. This means **statement 2** is incorrect.

**Statement 3** is incorrect because conductors disperse charge easily not insulators.

**Statement 4** is correct because insulators do not disperse charge easily.

4     **C**

Let  $x$ ,  $y$ , and  $z$  represent the cost of hire for the 1 person, 2 person and 3 person hoverboards respectively. Three different equations can now be written: 1 for the cost of hire, 1 for the maintenance cost and 1 for the statement that the 3 person hoverboard costs twice as much as the 1 person hoverboard.

$$(1) \quad x + y + z = 2460$$

$$(2) \quad 0.1x + 0.2y + 0.3z = 540$$

$$(3) \quad z = 2x$$

Equation 2 shows the % of the cost of hire of each hoverboard that has been paid towards maintenance, to reach the total maintenance cost of £540.

Now we need to solve the above equations to find values for  $x$  and  $y$ . You can make this question slightly easier for yourself by using equation (3) as it is a very easy one to work with.

Substitute  $z = 2x$  into equations (1) and (2) to eliminate  $z$ .

$$(4) \quad x + y + 2x = 2460$$

$$\Rightarrow 3x + y = 2460$$

$$(5) \quad 0.1x + 0.2y + 0.3(2x) = 540$$

$$\Rightarrow 0.7x + 0.2y = 540$$

Now we need to solve equations (4) and (5) **simultaneously**. There are multiple ways to do this; we have outlined only 2 methods below:





<u>Method 1</u>	<u>Method 2</u>
Rearrange (4): $y = 2460 - 3x$	Multiply both sides of equation (5) by 5 so you can subtract equation (4) from it: $0.7x + 0.2y = 540$
Substitute (4) into (5): $0.7x + 0.2(2460 - 3x) = 540$ $\Rightarrow 0.7x + 492 - 0.6x = 540$ $0.1x = 48 \Rightarrow x = 480$	(6) $\Rightarrow 3.5x + y = 2700$
Substitute $x = 480$ into the equation $y = 2460 - 3x$ to find $y$ : $y = 2460 - 3(480)$ $y = 2460 - 1440$ $y = 1020$	(6)-(4) $3.5x + y = 2700$ $- \quad 3x + y = 2460$ $\Rightarrow 0.5x = 240$ $\Rightarrow x = 480$
Finally, find the value of $z$ by substituting the value for $x$ into $z = 2x$ : $z = 2(480)$ $z = 960$	$z = 2(480) = 960$
$\Rightarrow x = 480, y = 1020, z = 960$ (C)	Rearrange equation (1): $x + y + z = 2460$ $\Rightarrow y = 2460 - x - z = 2460 - 960 - 480 = 1020$ $\Rightarrow x = 480, y = 1020, z = 960$ (C)

5 D - Statements 3 and 4 are correct.

1 is incorrect - respiration does occur in plants. It is an essential process that every living cell carries out to release energy.

2 is incorrect - **Aerobic** respiration is the **most effective way** of releasing energy from glucose, not anaerobic respiration. **Anaerobic** respiration is the **quickest way** to release energy from glucose, but it is very inefficient. Do not get these concepts mixed up!

3 is correct because using amino acids to make proteins requires energy, and **respiration releases energy** that can be used to build these macromolecules.

4 is correct as it describes an important feature of enzymes that you should remember: different enzymes work best at a different pH and temperature. Many enzymes will denature above a certain temperature. Furthermore, some enzymes are suited to a more alkaline pH, while enzymes in the stomach, for example, work optimally at a more acidic pH.

6 B

**Statement 1 is incorrect**- KCl contains **weaker** bonds than  $\text{CaCl}_2$ . Potassium ions have a 1+ charge, and calcium ions have a 2+ charge. Therefore, calcium ions have stronger forces of electrostatic attraction for the negative chloride ions.



**Statement 2 is correct** - Na has **fewer shells of electrons** than K. Fewer electron shells means that there is **reduced shielding** of the positive force of attraction from the nucleus on the electrons. Therefore, the electrons experience **greater forces of attraction** in NaCl than in KCl.

**Statement 3 is incorrect** - graphite is a **giant covalent structure** which can **conduct electricity in any state**, due to its delocalised electrons.

7 C

In a series circuit you calculate resistance using the equation:

$$R_T = R_1 + R_2 + R_3$$

$$25 = 15 + 10$$

Then using the equation:

$$\text{Voltage} = \text{Resistance} \times \text{Current}$$

$$35 = 25 \times \text{Current}$$

$$1.4 = \text{Current}$$

**D is incorrect** because it calculates resistance using the equation for parallel circuits instead of series circuits. This gives you a resistance of 1/25. Incorrect rearrangement of the equation **Voltage = Resistance x Current** can also give you answer D.



8 A

As the question is asking for the percentage increase in value, we first need to find the % **change** in value.

Then, identify the '**original value**' and its units:

'Original value' = £52

Identify the '**final value**' and its units. Change to have the same units as 'original value' if necessary.

'Final value' = £65

The question is looking for the 'percentage increase':

'% increase in value'

$$\begin{aligned} &= \frac{\text{change in value}}{\text{'original value'}} \times 100\% \\ &= \frac{\text{'original value'} - \text{'final value'}}{\text{'original value'}} \times 100\% \\ &= \frac{\pounds(65-52)}{\pounds 52} \times 100\% \\ &= \frac{13}{52} \times 100\% \\ &= \frac{1}{4} \times 100\% \\ &= 25\% \end{aligned}$$

**B** is incorrect because it simply takes the change in value as the percentage change.

**C** is incorrect because it uses  $\frac{\text{new value}}{\text{original value}} \times 100\%$ .

**D** is incorrect because it uses  $\frac{\text{change}}{\text{new value}} \times 100\%$ .

**E** is incorrect.

**Exam Tip** - % change =  $\frac{x-y}{x} \times 100\%$ , where  $x$  is the 'original value' and  $y$  is the 'final value'.

In words, % change =  $\frac{\text{'original value'} - \text{'final value'}}{\text{'original value'}} \times 100\%$



9 **D**

Information must be relayed to and from the CNS in order to maintain a stable internal environment in the body.

**A** incorrectly describes reflex actions. Although **a reflex action** is an innate automatic response, it **does not involve the CNS**. In order to make the response faster, it **bypasses the CNS** and sends impulses straight from the sensory neuron to a motor neuron, **via a relay neuron**.

**B** is false - the peripheral nervous system is comprised of motor and sensory neurons which carry impulses, while both the **brain** and the **spinal cord make up the central nervous system**.

**C** is incorrect - neurons do not make direct contact with one another; **there is a gap between 2 neurons known as a 'synapse'**. Neurotransmitters are chemical messengers released from the nerve ending of one neuron, which travel across this gap to stimulate the electrical impulse to be transmitted along the second neuron.

10 **B**

The first thing to note with this question, is that it asks for the configuration of a **non-metal**. Therefore, any options which do not show the configuration of a non-metal can immediately be ruled out.

Option A has **1** electron in its outer shell, meaning it is a **group 1 metal**, and can be ruled out. Similarly, option C has **2** electrons in its outer shell, meaning it is a **group 2 metal**, and can be ruled out.

This leaves us with options B, D and E showing non-metals.

Option E has 6 electrons in its outer shell whereas options B and D have 7 electrons in their outer shells. Since option E has to gain **2** electrons to complete its outer shell, it is **less reactive** than options B and D which only have to gain 1 electron to complete their outer shells of electrons.

We are now left with only options B and D. Option B has 3 electron shells, whereas option D has 4 shells of electrons.

In general, non-metals are **less reactive** as you go down the group. Since the number of electron shells increases down a group, option D will be **less reactive** than option B.







To understand **why more electrons shells** make a non-metal **less reactive**, we need to think about **shielding**. Electron shells have a “shielding” effect; they weaken the positive force of attraction between the nucleus and the electron shells. With more electrons shells, there is increased shielding, meaning the nucleus attracts electrons less, and it is harder to fill the outer shell of electrons.

Therefore, option B is **more reactive**, and is the correct answer as the most reactive non-metal in the list.

11 D

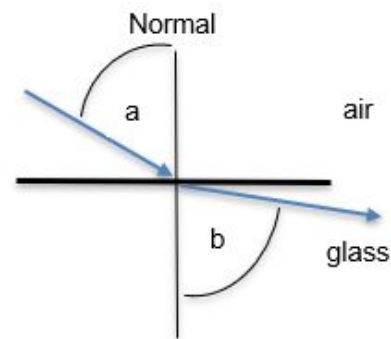
To answer this question, it is helpful to sketch out a diagram using the information given. Add the normal line at  $90^\circ$  to the boundary. We are told that the incident wave is at  $30^\circ$  to the surface – this tells us that the wave will be refracted, as the angle is not  $90^\circ$ . The angle of incidence (a on the diagram) is the angle between the incident wave and the normal (not the boundary). The angle of refraction is the angle between the refracted wave and the normal (b on the diagram). Therefore, as the wave speeds up when it enters the material and is refracted away from the normal, it is clear that the angle of refraction will be greater than the angle of incidence.

Statement 1 is incorrect because sound waves speed up when entering a solid from a gas – unlike EM waves, which will slow down due to the higher optic density.

*Statement 2 is correct because the part of the wave front reaching the boundary first will speed up first, causing the wave to refract away from the boundary.*

Statement 3 is incorrect because waves are refracted away from the normal when they enter (at an angle other than  $90^\circ$ ) a material in which they travel faster, so the angle of refraction is greater (NB Conversely if the wave travels more slowly in the new medium it will be diffracted towards the normal).

*Statement 4 is correct because sound waves travel faster in solids (e.g. glass) than in gases (e.g. air).*



12 E

Write down the ratio of cement to sand with their respective units:

Cement : sand

800g : 2.8kg

Convert the ratio into one with **common units**:

800g : 2800g

Simplify the ratio:

800g : 2800g

⇒ 8 : 28

⇒ **2 : 7**

**A is incorrect** because the units were converted wrongly. 2.8kg was converted to 280g instead. Remember that 1kg = 1000g!

**B is incorrect** because the units were not converted into **common units**. This results in the incorrect initial ratio to begin with (800 = 2.8).

**C is incorrect** because the ratio is not in its simplest form. The simplest form of a ratio cannot involve fractions or decimals.

**D is incorrect** because it is the ratio of sand to cement instead.

**Exam Tip** - It is important to convert units in a question into **common units**. This allows you to compare the values and make accurate calculations.

For example, in this question, it is difficult to compare 800g and 2.8kg because they have different units. Only by converting these values into common units (800g and 2800g) can you manipulate them.



13 E

**A is incorrect** - the stomach only produces a protease called **pepsin**, this has an optimum pH of **2**, allowing it to work in the acidic environment of the stomach.

**B is incorrect** - pepsin is a protease enzyme, meaning it breaks down proteins into amino acids. It does not break down starch.

**C is incorrect** - hydrochloric acid is produced to kill bacteria that get into our stomach and could be harmful to us. It's purpose is not to produce an optimum environment for bacteria.

**D is incorrect** - hydrochloric acid causes the stomach to maintain a pH of around **2**; this is the optimum pH for pepsin and helps protect us from harmful bacteria entering our stomach.

**E is correct** - *the muscular walls of the stomach aid digestion by churning the food. As mentioned above, pepsin is produced in the stomach.*

14 F

**1 is incorrect** - this is not a displacement reaction that will take place because **lead is less reactive than sodium**.

**2 is correct** - *this is a feasible displacement reaction because **zinc is more reactive than silver**.*

**3 is incorrect** - this is also not a reaction that will take place because **iodine is less reactive than bromine**; a less reactive halogen cannot replace the more reactive halogen.

**4 is correct** as it shows a feasible displacement reaction; **chlorine is more reactive than bromine**.

**Exam tip** - Knowing the order of reactivity of some key elements would be very beneficial in the BMAT exam.

From most reactive to least reactive:

*Potassium → sodium → lithium → calcium → magnesium → aluminium → carbon → zinc → iron → tin → lead → hydrogen → copper → silver → gold*

There are a lot of mnemonics that can help you remember this order. Have a look around for your favourite!



15 E

To calculate the total current flowing through the circuit use the equation:

$$\text{Energy (J)} = \text{Voltage (V)} \times \text{Current (A)} \times \text{Time (s)}$$

$$1300 = 20 \times A \times 180$$

$$A = 0.5$$

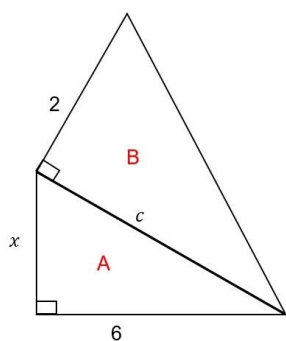
**A is incorrect** because 3 minutes was not converted into 180 seconds.

**B is incorrect** because 1.3kJ was not converted to 1300J.

**C is incorrect** because 3 minutes was not converted into 180 seconds and 1.3kJ was not converted to 1300J.

**D is incorrect** because 1.3kJ was not converted to 1300J but 130J.

16 A



$$\text{Total area of shape} = \text{Area of triangle A} + \text{Area of triangle B}$$

$$3 + 4x = \text{Area of A} + \text{Area of B}$$

$$\text{Area of triangle A} = \frac{1}{2} \times \text{base} \times \text{height} \quad \Rightarrow \frac{1}{2} \times 6 \times x$$

$$\Rightarrow 3x$$

$$\text{Area of triangle B} = \frac{1}{2} \times c \times 2$$

Find length  $c$  by using Pythagoras' Theorem  $a^2 + b^2 = c^2$

$$c^2 = 6^2 + x^2 \quad c^2 = 36 + x^2 \quad c = \sqrt{36 + x^2}$$

$$\text{Area of triangle B} = \frac{1}{2} \times \sqrt{36 + x^2} \times 2 \quad \Rightarrow \sqrt{36 + x^2}$$



$$\begin{aligned} \text{Total area of shape} &= 3x + \sqrt{36+x^2} \\ 3+4x &= 3x + \sqrt{36+x^2} \end{aligned}$$

Solve for  $x$

$$\begin{aligned} 3+x &= \sqrt{36+x^2} & \Rightarrow (3+x)^2 &= (\sqrt{36+x^2})^2 \\ \Rightarrow (3+x)(3+x) &= 36+x^2 & \Rightarrow 9+6x+x^2 &= 36+x^2 \\ \Rightarrow 6x &= 27 & x &= \frac{27}{6} \\ x &= \frac{9}{2} = 4.5 \end{aligned}$$

17 **E**

**A is incorrect** - humans have a double circulatory system: one containing deoxygenated blood, and the other containing oxygenated blood.

**B is incorrect** - it is true that humans have a double circulatory system, but they both enter the **atria**. The atria then pump blood into the ventricles.

**C is incorrect** - blood leaving the right side of the heart travels to the **lungs**. Blood in the left side of the heart has just come from the lungs, meaning it is oxygenated, and therefore goes to the body.

**D is incorrect** - as mentioned above, the left side of the heart pumps oxygenated blood to the rest of the body.

**E is correct** - the body has a double circulatory system in order to efficiently oxygenate and transport blood around the body.

**Exam Tip** - It is helpful to remember that blood leaving the **right side of the heart goes to the lungs**, and blood leaving the **left side of the heart is delivered to the rest of the body**. Just using this information will help to eliminate answers in these questions!



18 A

The answer options contain a different arrangement of 4 types of bonding: giant metallic, giant covalent, simple molecular and giant ionic lattice.

Let's look at the properties of each type of bonding in turn.

#### Giant metallic bonding

- Metallic bonding consists of metal cations and many delocalised electrons. The delocalised electrons are free to **conduct electricity**.
- There are strong forces of attraction between the metal cations and the delocalised electrons. Lots of energy is needed to overcome these forces of attraction and change the state of a substance with metallic bonding. So, substances with metallic bonding have **high boiling points**.

**Substance 2 has a giant metallic structure** as it conducts electricity and has a high boiling point.

#### Giant covalent bonding

- Structures with giant covalent bonds **cannot conduct electricity** because all electrons are used to form bonds. Graphite is an exception to this: it contains free electrons.
- Giant covalent structures have a **high boiling point** because they contain many strong covalent bonds which require lots of energy to be overcome.

**Substance 3 has a giant covalent structure** as it cannot conduct electricity and has a high boiling point.

#### Simple molecular bonding

- Compounds with simple molecular bonding have **low boiling points**. This is because the intermolecular forces between molecules are very weak, and require little energy to be overcome.
- There are no free electrons, and so simple molecular substances **cannot conduct electricity**.

**Substance 1 has a simple molecular structure** because it has a low boiling point and cannot conduct electricity.

#### Giant Ionic bonding

- Compounds with giant ionic bonding can **conduct electricity when they are molten or dissolved**. This is because in these states, the ions are mobile and can carry a charge.



- Giant ionic compounds have **high boiling points** because there are strong forces of electrostatic attraction between ions, which require a lot of energy to overcome.

**Substance 4 has a Giant Ionic structure.**

Therefore, **option A** is the correct answer.

**19 B**

Each loop in a parallel circuit has the same voltage as the electrons entering it have the same amount of energy. This means statement 2 is correct and therefore statement 4 is incorrect.

The total current is split between each branch of the circuit so the non-identical resistors have different currents running through them in the parallel circuit. Total current in a parallel circuit is calculated by the equation:

$$I_T = I_1 + I_2 + I_3.$$

Therefore statement 3 is correct and statement 1 is incorrect.

**20 B**

Let the sum of money Rachel deposits be  $x$

$$50 = \frac{x(3.75 - 3.5)(1)}{100}$$

$$5000 = 0.25x$$

$$x = 20000$$

Alternative method:

The difference in interest rates is  $3.75\% - 3.5\% = 0.25\%$ .

Since we are told 'Rachel's interest will decrease by £50 in a year', we know that this 0.25% is £50. We can use this to calculate the sum deposited:

$$0.25\% = £50 \Rightarrow 1\% \text{ is } £50 \times 4 = £200 \Rightarrow 100\% \text{ of sum deposited is } £20000.$$

**C is incorrect** because the incorrect value of 3.75% is inserted for the decrease in interest rate rather than the actual decrease of 0.25%.



**D is incorrect** because the incorrect value of 3.5% is inserted for the decrease in interest rate rather than the actual decrease of 0.25%.

**E is incorrect** because it does not address the identity theft part of the conclusion.

21 **E**

All of the statements are possible causes of species extinction, apart from statement **E - natural selection is a normal mechanism by which a species evolves**. Less-adapted individuals are less likely to survive and have offspring, so overtime, the less-adapted characteristics become less frequent in the population, while the opposite occurs for more-adapted characteristics, which become more common. **Natural selection, therefore, does not lead a species to extinction, but rather tends to lead a species to becoming better-adapted to survival in their environment.**

22 **C**

The key steps to work out the molecular formula of this compound involve determining the molecular mass of the compound and then dividing this mass over the 3 elements to determine how many atoms of each element are present in the molecule.

The molecular mass of the compound can be calculated using the mass and volume information provided in the question:

1 mole of a gaseous compound occupies a volume of  $24\text{dm}^3$  at room temperature and pressure. Using this, we can deduce  $240\text{dm}^3$  of the compound must contain 10 moles.

So 10 moles of the compound weighs 800g and so 1 mole of the compound weighs 80g. Hence the relative molecular mass must be 80.

The ratio of the compound by mass of N:H:O is 7:1:12. The total mass of this ratio is 20.

Dividing 80 by 20 = 4 and so each 1 part of the ratio is 4.

This means the relative masses of each element are:

$$\text{N: } 4 \times 7 = 28$$

$$\text{H: } 4 \times 1 = 4$$

$$\text{O: } 4 \times 12 = 48$$

Using the  $A_r$  values, the actual number of each atom can be worked out:

$$\text{N: } 28 \div 14 = 2$$

$$\text{H: } 4 \div 1 = 4$$





O:  $48 \div 16 = 3$

Therefore there are 2 nitrogens, 4 hydrogens and 3 oxygens.

And so the molecular formula is  $N_2H_4O_3$

23 **E**

None of the statements are correct.

**Statement 1 is incorrect** as 2 neutrons and 2 protons form the emitting alpha particle, the mass of the nuclei changes.

**Statement 2 is incorrect** as a high speed electron is emitted in beta negative decay, whereas a high speed positron is emitted in beta positive decay.

**Statement 3 is incorrect** as in beta negative decay, the electron is not emitted from the electron orbitals so an ion is not formed.

24 **A**

Let  $x$  be the total sum of money.

$$\frac{3}{2+3+5}(x) = 13.50$$

$$\frac{3}{10}(x) = 13.50$$

$$x = 13.50 \times \frac{10}{3} \\ = 45$$

4.5

$$13.50 \times \frac{10}{3} = 45$$

An alternative method is simply recognising that Emme's share is 3 'parts'. Divide £13.50 by 3 to get the value of 1 'part' as £4.50. As there is a total of 10 'parts', the total sum of money is

$$£4.50 \times 10 = £45.$$

**B is incorrect** because it uses the wrong ratio, taking Emme's share to be  $\frac{2}{10}$  instead.

**C is incorrect** because it uses the wrong ratio, taking Emme's share to be  $\frac{5}{10}$  instead.



25 F

**1 is correct** - symptoms of Huntington's Disease include shakiness, poor focus, poor memory, mood swings and clumsiness. These symptoms are all **neurological**, meaning they affect the nervous system. Knowing that Huntington's Disease involves the degeneration of nerve cells in the brain may help you recall the symptoms better, although you don't need to know this for the BMAT exam.

**2 is correct** - Huntington's is caused by a **dominant allele**.

**3 is correct** - Polydactyly is also caused by a **dominant allele**. It has the same inheritance pattern. Make sure you know whether each of these 3 genetic disorders is caused by a dominant or recessive allele.

**4 is incorrect** - the **symptoms of Huntington's usually begin after the age of 40**. This is an important consideration because it means people may pass the genetic disorder onto their kids before they even develop symptoms or know that they have the disorder themselves.

26 C

Using the balanced equation provided, we can see 2 moles of  $\text{KNO}_3$  gives 1 mole of  $\text{O}_2$ . According to the molar volume of gas law, 1 mole of a gas occupies a volume of  $24\text{dm}^3$  at room temperature and pressure (rtp).

Mr of  $\text{KNO}_3 = 39 + 14 + 16 + 16 + 16 = 101$  .

And so 1 mole of  $\text{KNO}_3$  is 101 g

2 moles of  $\text{KNO}_3$  gives 1 mole of  $\text{O}_2$  and so  $2 \times 101\text{g}$  gives 1 mole of  $\text{O}_2 \Rightarrow 202\text{g}$   $\text{KNO}_3$  gives 1 mole of  $\text{O}_2$ .

1 mole of  $\text{O}_2$  occupies  $24\text{dm}^3$  at rtp and so  $202\text{g}$  of  $\text{KNO}_3$  gives  $24\text{dm}^3$  of  $\text{O}_2$  at rtp.

If  $24\text{dm}^3$   $\text{O}_2$  at rtp is produced by  $202\text{g}$  of  $\text{KNO}_3$ ,  
then  $1\text{dm}^3$   $\text{O}_2$  at rtp is produced by  $202 \div 24$   $\text{KNO}_3$

Approximate the calculation of  $202 \div 24$  to  $200 \div 25 \Rightarrow = 8$

Approximately 8g of  $\text{KNO}_3$  are needed to produce  $1\text{dm}^3$  of  $\text{O}_2$  at rtp. Option C is the closest answer to this and so option C is correct.



27 **D**

**1 is correct** - it is true that **thermal radiation travels at the speed of light**. Thermal radiation is a wave of radiation that is part of the **electromagnetic spectrum**, all waves part of the electromagnetic spectrum travel at the speed of light.

**2 is incorrect** - this is because thermal radiation **does not require a medium to travel**. **Thermal radiation can travel through a vacuum**.

**3 is correct** - it is true that **heat is transferred to the earth by thermal radiation from the sun**. This is because thermal radiation can travel through space.

**4 is correct** - it is true that infrared radiation (thermal radiation) is **not seen by the eye**, however it can be felt by the heat it produces.

**5 is incorrect** - this is because for an object to emit thermal radiation its **temperature needs to be above absolute zero** (this is the lowest temperature possible).

Since **1, 3** and **4** are the only correct statements, **D** must be the correct answer.

