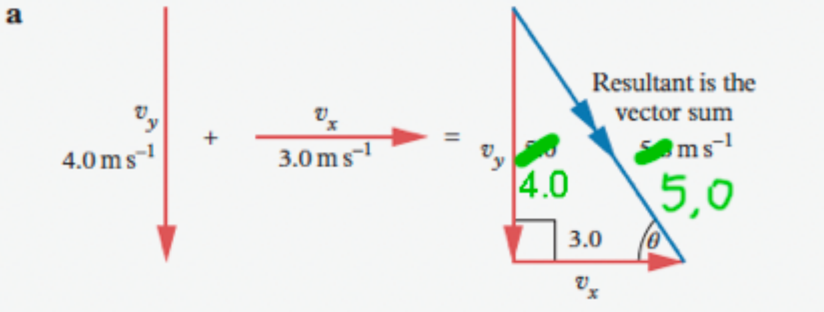
ERRATA U 3& 4

OXFORD *PHYSICS FOR QUEENSLAND* U3&4 (2025)

<table>
<tr><th>Module</th><th>Correction being made</th><th>Digital updated</th></tr>
<tr><td>2.1 WE2.1D
page 58</td><td>

v_y should be 4.0 not 5.0, and other values as shown:

a



(1 mark)

b Resultant impact velocity = $\sqrt{3^2 + \cancel{5}^2}$ 4

= $\sqrt{\cancel{34}}$ 25

= ~~5.8~~ m s⁻¹ (1 mark)

5.0

$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$

$= \frac{\cancel{5}}{3}$ 4

$\theta = \tan^{-1}\left(\frac{\cancel{5}}{3}\right)$ 4

53 = ~~59~~° to the horizontal (1 mark)

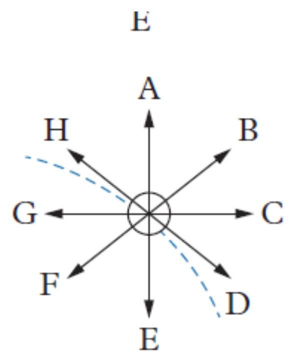
v = ~~5.8~~ m s⁻¹ at ~~59~~° to the horizontal (1 mark)

5.0 53

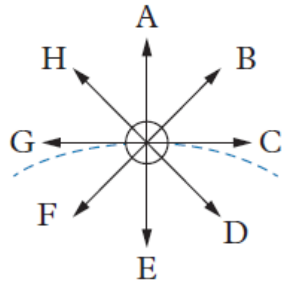
</td><td>No
10.1.26</td></tr>
<tr><td>2.5A
Review Q</td><td>

Swap diagrams for (b) and (c)

b at its highest point

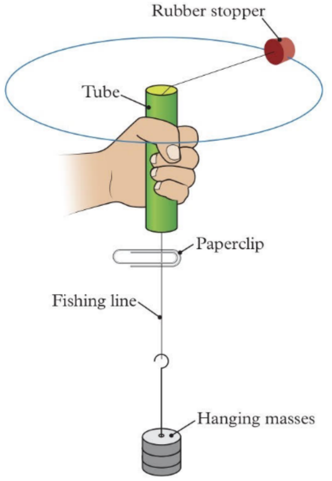
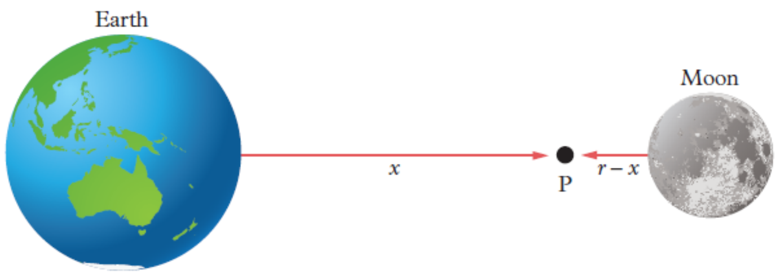


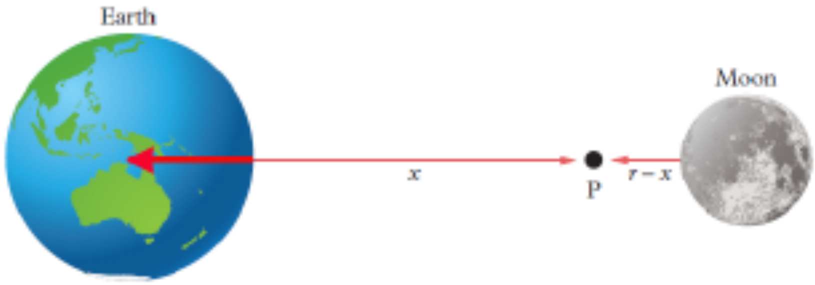
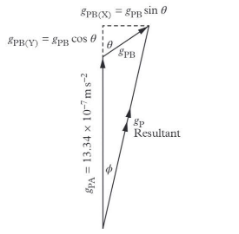
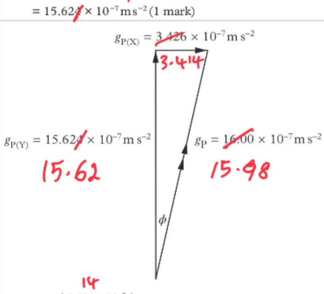
c shortly before it hits the ground.



</td><td>No
10.1.26</td></tr>
</table>

3.2 WE3.2D (b) and (e)	**b** $F_H = F_A \cos\theta$ $= \sout{400} \cos 30°$ (1 mark) 416 416 $= \sout{400} \times 0.866$ $= \sout{346}$ N (1 mark) to the right (1 mark) (3 s.f.) 360 **e** Frictional force $F_f = \sout{346}$ 360 N (because $F_f = -F_H$ when speed is constant) (1 mark)	No 10.1.26
3.3 WE3.3 step 4	3753 +3550 should be 3753 – 3550 $F_{net} = F_{up} - F_{g2}$ $= 3{,}753 + 3{,}550$ $= 203$ N up the incline (1 mark)	Yes 10.1.26
3.3 WE3.3B	Step 9: Calculate percentage error. Use the unrounded answer in your calculations. Note that for percentage error calculations the true value has to be in kelvin. $\%\ \text{error} = \left\| \frac{\text{measured value} - \text{true value}}{\text{true value}} \right\| \times 100\%$ $\%E = \frac{E_A}{x_A} \times 100$ $= \frac{1.25}{\sout{22.5}} \times \sout{100}$ → $\frac{1.25}{(22.5+273)} \times 100$ $= \sout{5.56\%}$ (1mark) $= 0.42\%$ Step 10: Finalise your answer and make sure you have included the correct units and significant figures. $\sout{5.6\%}$ (2 s.f.) (1 mark) → 0.42% (2 s.f.) (1 mark) Your turn Students mixed 100.0 g of water at 10.0°C with 100.0 g of water at 80.0°C. Their experimental equilibrium temperature was 43.0°C. **Determine** the theoretical equilibrium temperature (3 s.f.) assuming there was no heat exchange with the environment, and the absolute and percentage errors in their result (2 s.f.). (6 marks) that's a lower-case k NOT CAPITAL K	
4.3 CYL4.3 Q 11b answer	The correct answer is in blue. b. **Determine** how much time it takes the car to complete one lap of the circular track. (2 marks) The car was found in part (a) to not be able to navigate the corner as there was not enough friction to keep it on the road. (1 mark) The car would not be able to complete one lap. (1 mark)	
4.3 page 159	gravity and the centripetal force. That's why it has a greater length. The normal force can be resolved into two components: one vertical, $F_N \sout{\sin}\theta$ (cos), and one horizontal, $F_N \sout{\cos}\theta$ (sin). There is no acceleration in the vertical direction so $F_N \cos\theta$ must	No 10.1.26
4.3 WE4.3E Step 2	**a** $v = \frac{2\pi r}{T}$ $= \frac{2\pi \times 0.25}{1.00}$ (1 mark) $= \sout{1.257}\ \text{m s}^{-1}$ 1.571 $= \sout{1.3}\ \text{m s}^{-1}$ (2 s.f.) (1 mark) 1.6	No 10.1.26

4.5 ReviewQ 4.5A Q4	of mass M **4** A student is investigating centripetal motion by whirling a rubber stopper (of mass M) above his head in a horizontal circle at constant speed.  They increase the mass, *m*, of the hanging slotted masses but want to keep the radius, *r*, constant. To do this, they must **A** increase ~~*m*~~ M or *v*. **B** increase ~~*m*~~ M or decrease *v*. **C** decrease ~~*m*~~ M or increase *v*. **D** decrease ~~*m*~~ M or *v*.	No 10.1.26
5.2	Physics U3&4 Module 5.2 page 179 **Skill drill** **Identifying relationships** **Science inquiry skills: Processing and analysing data (Lesson 1.7)** In most experiments we manipulate the independent This shows the relationship is linear with a constant m = ~~2~~ 1.5. The equation is y = ~~2x~~. **1.5x** For DV2, doubling the IV quadruples the DV, so	no 10.1.26
5.2 Page 179	2.92 kg. These can be substituted into the equation: $$G = \frac{Fr^2}{Mm}$$ Change 2.92 to 1.46	no
5.3 CYL5.3 Q5	Change 10^{27} to 10^{24} CYL 5.3 U3+4 **5** **Calculate** the gravitational field strength at a point 100,000 km above Earth's centre. The mass of the Earth m_{Earth} = 5.97 × ~~10^{27}~~ 10^{24} kg, mean radius of Earth r_{Earth} = 6.37 × 10^6 m (3 s.f.). (3 marks)	No 10.1.26
5.3 WE5.3A	PHYSICS U3+4 **Worked example 5.3A** **Gravitational field strength using weight** A 650 g mass is allowed to hang freely off a spring balance on the Moon. The scale is in newtons (N) and the weight reading on the scale is 1.06 N. **a** **Calculate** the gravitational field strength on the Moon in ~~N C^{-1}~~ N kg^{-1}. Give your answer to an appropriate number of significant figures. (2 marks) **b** **Express** the gravitational field strength on the Moon as acceleration due to gravity on the Moon in m s^{-2}. Give your answer to an appropriate number of significant figures. (1 mark)	no 10.1.26
5.3 Fig 5 page 188	 	no 10.1.26

	Red line should extend to centre of Earth and have an arrow head  	
5.3 CYL5.3 Q 5.	10^{24} **5** **Calculate** the gravitational field strength at a point 100,000 km above Earth's centre. The mass of the Earth m_{Earth} = 5.97 × 10^{27} kg, mean radius of Earth r_{Earth} = 6.37 × 10^6 m (3 s.f.). (3 marks)	no 10.1.26
5.3 WE5.3A. Your turn.	PHYSICS **Your turn** The gravitational field strength on Mars is 3.7 ~~N C⁻¹~~ N kg^{-1}. **Calculate** the gravitational force acting on a 2.5 kg object on Mars. Give your answer to an appropriate number of significant figures. (2 marks)	no 10.1.26
5.3 WE5.3E Step 6	Step 6: Calculate the gravitational field strength at P due to black hole B (g_{PB}). (1 mark for "Calculates the field at P due to B") $g_{PB} = \frac{GM_A}{r_{PA}^2}$ $= \frac{6.67 \times 10^{-11} \times 100 \times 2 \times 10^{30}}{(1.803 \times 10^{14})^2}$ = ~~0.4117~~ × 10^{-6} m s^{-2} (1 mark) 0.4103 Step 7: Add the two vectors g_{PA} and g_{PB} by joining the arrows head to tail. Draw in the resultant vector, g_P. (1 mark for "Draws correct vector diagram")  (1 mark) 	No 10.1.26
5.3 WE5.3E	**Think** / **Do** Step 8: Resolve the two vectors g_{PA} and g_{PB} into components along the x- and y-axes. (1 mark for "Calculates the components of the field on P due to B") $g_{PB(x)} = g_{PB} \sin\theta$ 0.4103 = ~~0.4117~~ × 10^{-6} sin 56.31° = ~~3.426~~ × 10^{-7} m s^{-2} 3.414 $g_{PB(y)} = g_{PB} \cos\theta$ 0.4103 = ~~0.4117~~ × 10^{-6} cos 56.31° 2.276 = ~~2.284~~ × 10^{-7} m s^{-2} (1 mark) Step 9: Add the x-components of the two vectors and add the y-components of the two vectors. (1 mark for "Calculates the sum of fields in both directions") x-component: $g_{PA(x)}$ = 0 $g_{PB(x)}$ = ~~3.426~~ × 10^{-7} 3.414 $g_x = g_{PA(x)} + g_{PB(x)}$ 3.414 = ~~3.426~~ × 10^{-7} m s^{-2} y-component: $g_{PA(y)}$ = 13.34 × 10^{-7} $g_{PB(y)}$ = ~~2.284~~ × 10^{-7} 2.276 $g_y = g_{PA(y)} + g_{PB(y)}$ = 13.34 × 10^{-7} + ~~2.284~~ × 10^{-7} 2.276 = ~~15.624~~ × 10^{-7} m s^{-2} (1 mark) Step 10: Add the two vectors g_x and g_y by joining the arrows head to tail. Draw in the resultant vector, g_P. Solve for the resultant, g_P. Calculate the angle, ϕ. (1 mark for "Provides correct mathematical reasoning")  $\phi = \tan^{-1}\left(\frac{3.426 \times 10^{-7}}{15.624 \times 10^{-7}}\right)$ (14) = ~~12.4°~~ (1 mark) 12.3 ✓ Step 11: Give your answer to an appropriate number of significant figures, in this case 3 s.f. Use the correct units. Make sure you include the direction. (1 mark for "Provides correct answer") The gravitational field at P is 16.0 m s^{-2} (3 s.f.) at an angle of ~~12.4°~~ 12.3 towards B from the line joining A and P. (1 mark)	No 10.1.26

	Note also: The first line in Step 11 should read "The gravitational field at P is 16.0×10^{-7} ms^{-1} (3 s. f.) …….	
5.4	**Real-world physics** U3&4 Physics Lesson 5.4 Apply your understanding 1. Starlink satellites are at 550 km altitude. **Calculate** the time in milliseconds for a signal to go from the ground to the satellite. (1 mark) $t = \frac{\text{distance}}{\text{speed}}$ $= \frac{550 \times 1{,}000}{3 \times 10^{8}}$ $= 1.8 \times 10^{-1}$ s or 1.8 ms (1 mark) 10^{-3}	
5.4 p 198, print copy only	152,098,200 km, a difference of 5 million km. The difference in radius between the two is about 1.5 per cent, which means the orbit is almost circular. For example, consider an ellipse Remove space between "about" and "1.5 per cent"	Yes 10.1.26
5.4 Real World P207	Most pass the **Medium Earth Orbit** (MEO), altitude 1,200–35,790 km, period 2–24 h **Uses:** Global positioning satellites (GPS) at 20,000 km, microgravity experiments **Features:** ~~Passes~~ same spot twice a day; has short round-trip for signals; more sol radiation so it has a shorter life than LEOs	No 10.1.26
5.4 WE 5.4B Page 203	$T_s = 1.0$ day, $T_M =$ ~~28~~ 27.3 days, $r_M = 3.8 \times 10^8$ m $r_s = ?$ $\frac{T_a^2}{r_a^3} = \frac{T_b^2}{r_b^3} = \text{constant}$ Change 28 days to 27.3 days	no 10.1.26
5.4 WE5.4B page 203	**Artificial satellites orbiting Earth** A satellite is launched into orbit around Earth. Knowing that the natural satellite of Earth (the Moon) ha period of ~~28~~ days and an orbiting radius of 3.8×10^8 m, **calculate** the desired orbital radius for the artifi satellite so that it has a period of 1 day. Give your answer to an appropriate number of significant figures. (4 marks) 27.3 …change 28 days (line 3) to 27.3 days	no 10.1.26

<table>
<tr>
<td>6.1 page 232</td>
<td>

What experiments are done using Coulomb's law?

A great experiment to determine the charge on two spheres involves the use of two ping pong balls coated in conductive paint or wrapped in aluminium foil. The balls, each of mass m, are suspended from a common point by cotton threads of length L. When the balls are given equal ~~negative~~ positive charge, they move apart and finally settle in a rest position a distance r apart. This makes an angle θ to the vertical (Figure 13). Using vector diagrams and Coulomb's law calculations, we can work out the charge on the balls and compare

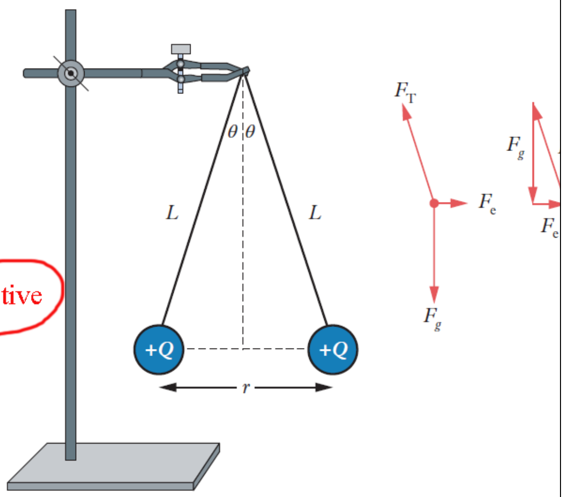


FIGURE 13 Diagram of the ping pong ball setup, along with a free-body diagram and a vector diagram of the forces
</td>
<td>no 10.1.26</td>
</tr>
<tr>
<td>6.2 WE6.2D</td>
<td>

Step 4: Calculate the field strength at C due to A using $E = \frac{kq}{r^2}$. Convert nm to m. (1 mark for "Calculates field strength at C by A")	$E_{CA} = \frac{9\times10^9\times3\times10^{-9}}{(0.30)^2}$ = 300 N C^{-1} (1 mark)
Step 5: Calculate the field strength at C due to ~~A~~ B using $E = \frac{kq}{r^2}$. Convert nm to m. (1 mark for "Calculates field strength at C by ~~A~~ B")	$E_{CB} = \frac{9\times10^9\times34\times10^{-9}}{(0.87)^2}$ = 401 N C^{-1} (1 mark)

</td>
<td>no 10.1.26</td>
</tr>
<tr>
<td>6.5 Data Drill page 270</td>
<td>

Data drill

Effect of separation distance on force

A pair of lightweight conductive ping pong balls were suspended from a common point by cotton thread (Figure 1). The balls were given an equal ~~negative~~ charge and allowed to come to rest. The distance apart was varied and the force between the balls was measured.

positive
</td>
<td>no 10.1.26</td>
</tr>
<tr>
<td>7.1 Fig 3</td>
<td>

Change the diagram in the bottom right to look like this. Note that the arrow heads have been corrected.

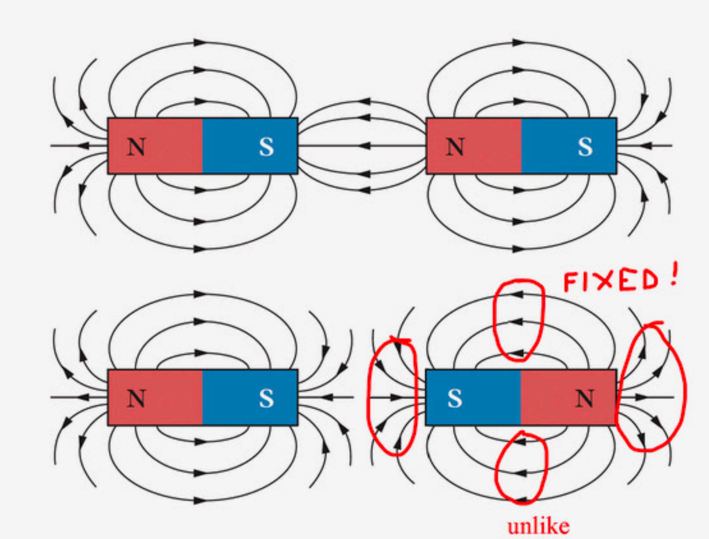
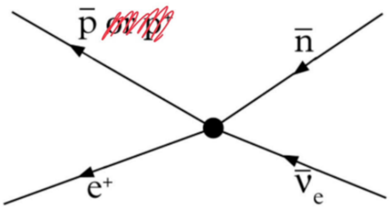


FIGURE 3 Field lines around two magnets with ~~like~~ unlike poles facing, and with ~~u~~nlike poles facing
</td>
<td>No 10.1.26</td>
</tr>
</table>

7.2 Table 1 page 284	**Magnetic fields** $B = \frac{\mu_0 I}{2\pi r}$ Field strength is directly proportional to the ~~charge~~. current	no 10.1.26
13.1	Mesons 13.1 page 560 $u\bar{d}$ Mesons are named from the Greek "mesos" meaning "middle", because they are between protons and electrons in mass. Mesons are part of the hadron particle family and are defined simply as particles composed of a quark and an antiquark bound together by the strong nuclear force. All mesons are unstable, with the longest lived lasting for just under a second. They can carry an electric charge of −1, 0, or +1. Some examples of mesons are shown in Figure 3. The first meson is called a pion (π^+) and is shown in Figure 3A. It is made up of an up quark and an antidown quark ($\bar{u}d$) and has a net electric charge of +1e. In this example the colours are red and antired (cyan), which add to white when combined. This is called colour neutral (white); all composite particles must be colour neutral.	
Mod 14 Answers	 	??
U1&2 2.9 CYL2.9 Q7	Physics for Qld U1&2 CYL 2.9 Q7 honey 7 For a demonstration to introduce specific heat capacity to a Year 11 Physics class, equal masses of water, ~~ethanol~~ and paraffin were added to separate beakers and placed on a hotplate. After 2 minutes, the water temperature was measured as 60°C. **Calculate** the temperatures of the other two substances and **organise** them from lowest to highest temperature. (5 marks)	no 10.1.26