CfE

Higher

Physics dept

Unit 1 Our Dynamic Universe

Learning Outcomes

Name_____ Teacher_____

✓	**I am confident that I understand this and I can apply this to problems**
?	**I have some understanding but I need to revise this some more**
✘	**I don't know this or I need help because I don't understand it**

1.1 Equations of Motion	Covered (✓)	How well can you do this?
1. Can I calculate the equivalent vector by scale diagram or otherwise for vectors in a non-right angled triangle?		✘ ? ✓
2. Can I carry out calculations to find the horizontal and vertical components of vectors using the relationships: $V_H = V\cos\Theta$ $V_V = V\sin\Theta$?		✘ ? ✓
3. Can I carry out calculations using the kinematic relationships: $v = u + at$, $s = ut + \frac{1}{2}at^2$, $v^2 = u^2 + 2as$ for objects moving with a constant acceleration in a straight line?		✘ ? ✓
4. Can I interpret displacement–time graphs? e.g. gradient is velocity		✘ ? ✓

	Covered (✓)	How well can you do this?
5. Can I interpret velocity–time graphs including: a) area under graph is displacement b) gradient is acceleration c) objects in freefall taking into account air resistance and changing surface area (covered in 1.2 Forces)?		✗ ? ✓
6. Can I draw and interpret acceleration – time graphs using information obtained from a velocity – time graph for motion with a constant acceleration?		✗ ? ✓
7. Can I identify and interpret motion – time graphs of: a) bouncing objects and b) objects thrown vertically upwards?		✗ ? ✓

1.2 Forces, Energy and Power	Covered (✓)	How well can you do this?
8. Can I analyse the motion of an object using free body diagrams and Newton's first and second laws?		✗ ? ✓
9. Can I carry out calculations using Newton's second law (F=ma) in one direction only?		✗ ? ✓
10. How does the direction of frictional forces compare to the direction of motion of an object?		✗ ? ✓
11. Can I carry out calculations using Newton's second Law (F=ma) when a number of opposing forces act on an object in the horizontal direction?		✗ ? ✓
12. Can I analyse and carry out calculations using Newton's second law (F=ma) and W=mg when a number of opposing forces act on an object in the vertical direction? e.g rockets, lifts etc		✗ ? ✓
13. Can I carry out calculations using Newton's second law (F=ma) when investigating internal forces (Tension exerted by a string or cable) e.g. car pulling a caravan etc?		✗ ? ✓

	Covered (✓)	How well can you do this?
14. Can I carry out calculations using Newton's second law (F=ma) when an object is on an incline (slope)? *(components of weight = mgsinΘ & mgcosΘ)*		✗ ? ✓
15. Can I analyse and calculate the horizontal and vertical component of vectors (including forces)?		✗ ? ✓
16. Can I carry out energy calculations involving work done, potential energy, kinetic energy and power in a) familiar situations b) unfamiliar situations?		✗ ? ✓
17. Can I carry out calculations and analyse situations involving the conservation of energy?		✗ ? ✓

1.3 Collisions, Explosions and Impulse	Covered (✓)	How well can you do this?
18. Can I carry out calculations using the equation $p=mv$?		✗ ? ✓
19. Can I state the law of conservation of momentum?		✗ ? ✓
20. Can I carry out calculations using *p before = p after* for collisions between objects moving in the same direction?		✗ ? ✓
21. Can I carry out calculations using *p before = p after* for collisions between objects moving in opposite directions?		✗ ? ✓
22. What is meant by an: a) elastic collision b) inelastic collision?		✗ ? ✓
23. Can I use the equation $E_k = ½ mv^2$ to establish whether a collision is elastic or inelastic?		✗ ? ✓

	Covered (✓)	How well can you do this?
24. Can I carry out calculations using *p before = p after* for explosions in one dimension?		✗ ? ✓
25. Can I apply the law of conservation of momentum to the interaction of two objects moving in one dimension to show that the forces acting on each object are equal in size and opposite in direction.		✗ ? ✓
26. Can I carry out calculations using the equation *Impulse = Force x time of contact*?		✗ ? ✓
27. How does Impulse and change in momentum compare in size during a collision in one dimension?		✗ ? ✓
28. Can I carry out calculations using the equation *Ft = mv-mu?*		✗ ? ✓

	Covered (✓)	How well can you do this?
29. Can I identify the shape of a force – time graph of a collision in one dimension?		✗ ? ✓
30. Can I interpret force – time graphs including: a) area under graph is impulse b) changing the time of impact to see the effect on the average force and impulse e.g. use of crumple zones and air bags		✗ ? ✓

1.4 Gravitation	Covered (✓)	How well can you do this?
31. How does the vertical motion of a dropped object compare with an object which has been projected horizontally?		
32. Can I describe the vertical motion of an object which has been projected a) horizontally b) upwards at an angle (oblique)?		✗ ? ✓
33. Can I describe the horizontal motion of an object which has been projected a) horizontally b) upwards at an angle?		✗ ? ✓
34. Can I carry out calculations using $d = vt$ *(horizontal component)* $v = u + at$, $s = ut + \frac{1}{2}at^2$, $v^2 = u^2 + 2as$ *(vertical component)* for objects projected horizontally?		✗ ? ✓

	Covered (✓)	How well can you do this?
35. Can I carry out calculations using $d = vt$ *(horizontal component)* $v = u + at$, $s = ut + \frac{1}{2}at^2$, $v^2 = u^2 + 2as$ *(vertical component)* for objects projected upwards at an angle?		✗ ? ✓
36. Using Newton's thought experiment, can I explain how satellites remain in orbit?		✗ ? ✓
37. What does the magnitude of the gravitational field depend upon?		✗ ? ✓
38. How do scientists believe stars were formed?		✗ ? ✓
39. Can I carry out calculations using the equation $F = \frac{Gm_1m_2}{r^2}$		✗ ? ✓
40. Can I state an application of gravitational force?		✗ ? ✓

1.5 Special relativity	Covered (✓)	How well can you do this?
42. Do I know that the speed of light in a vacuum is the same for all observers in all reference frames?		✖ ? ✓
43. Can I describe the motion of an object in terms of an observer's frame of reference, using time dilation and length contraction?		✖ ? ✓
44. Can I carry out calculations involving time dilation, i.e. $t' = \frac{t}{\sqrt{1-\left(\frac{v^2}{c^2}\right)}}$		✖ ? ✓
45. Can I carry out calculations involving length contraction, i.e. $l' = l\sqrt{1-\frac{v^2}{c^2}}$		✖ ? ✓
	Covered (✓)	How well can you do this?
46. Do I know the minimum speed at which relativistic effects are observed?		✖ ? ✓

1.6 The Expanding Universe	Covered (✓)	How well can you do this?
47. Can I explain what is meant by the Doppler effect?		✘ ? ✓
48. Can I state which types of waves undergo the Doppler effect?		✘ ? ✓
49. Can I calculate the apparent frequency detected by a stationary observer relative to a moving source of sound waves?, i.e. $f_o = f_s \frac{v}{(v \pm v_s)}$		✘ ? ✓
50. Can I explain what is meant by redshift?		✘ ? ✓

	Covered (✓)	How well can you do this?
51. Can I carry out calculations using $z = \frac{\Delta\lambda}{\lambda_o}$ to calculate the redshift of a galaxy?		✘ ? ✓
52. Can I carry out calculations using $z = \frac{v_{galaxy}}{c}$ to calculate the redshift of a galaxy at non-relativistic speeds?		✘ ? ✓

	Covered (✓)	How well can you do this?
53. Can I explain what is meant by Hubble's Law?		✗ ? ✓
54. Can I carry out calculations using Hubble's Law, i.e. $v = H_o d$		✗ ? ✓
55. Can I explain how Hubble's Law allows us to estimate the age of the universe?		✗ ? ✓
56. Can I describe the evidence which has lead to the theory that the universe is expanding?		✗ ? ✓
57. Can I explain how the rate of expansion of the universe is changing and name the force responsible for this?		✗ ? ✓
58. Can I describe how observations can be used to estimate the mass of our galaxy?		✗ ? ✓

	Covered (✓)	How well can you do this?
59. Do I know what is meant by the term dark matter?		✘ ? ✓
60. Can I describe the evidence for dark matter?		✘ ? ✓
61. Do I know what is meant by the term dark energy?		✘ ? ✓
62. Can I describe the evidence for dark energy?		✘ ? ✓

The Big Bang	Covered (✓)	How well can you do this?
63. Can I describe the relationship between the temperature of a stellar object and the wavelength distribution of radiation it emits?		✗ ? ✓
64. Do I know how the peak wavelength of emitted radiation is related to the object's wavelength?		✗ ? ✓
65. Do I know how the intensity of radiation is related to the temperature of the star?		✗ ? ✓
66. Do I know what is meant by the cosmic microwave background radiation?		✗ ? ✓
67. Can I describe evidence to justify the Big Bang as a theory for the beginning and evolution of the Universe?		✗ ? ✓